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The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*
Editorial Offices: Investment Bldg., Washington, D. C.

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VOL. XXI WASHINGTON, D. C., MAY 1937 No. 7

Insist on the present and —

Nix on Nostalgia

Jeff McDermid

AFTER the mud from the spring thaw recedes I once more meander countryward in my internal-explosion perambulator. One of my frequent by-paths takes my snorting six over the cement causeway known of old as the toll-gate plank road. It leads into the town where I was fetched up, but which has many other nobler distinctions and reflected glories to stimulate the pride of its placid citizens.

For instance, it once had a pioneer fortress and a stockade to facilitate safer trade relations for the clever ones who dealt with the Indians; and at one time in the nineties this burg had a saloon for every 100 souls; and moreover, a man was hanged by a mob two blocks from the Methodist meeting house. It also boasts most of the modern service clubs and other luxuries, and it is the stopping point for a dashing stream-lined train.

As I drive slowly down the main street, hardly a familiar face mugs at me from the sidewalks. The buildings are pretty much the same as they were when I departed 30 years ago, although the food store signs have been changed since the eggs and cheese.

There at the head of the principal avenue still stands the court house of dun-colored brick, surmounted by a squatty dome, o'ertopped by a wooden effigy supposed to represent justice

with her sword and scales. In childish times I lived in a canary-yellow cottage trimmed with red oxide barn paint, about three blocks from this awesome seat of judicial majesty.

Once there was a storm that blew Justice down on the flag-stone walk, and they labored as long and hard to get her back on her perch as our juries did to dispense equality in divorce cases and contested wills. She stands a bit askew like some of the decisions in these (and other courts), but for all I see she is just as stiff and blind as ever.

NOT long ago I parked opposite the court house for awhile, to visit with the county agent—an official unknown to our rugged days of ignorant competition. I found him ensconced in the still dingy basement, right in the northeast corner where my father used to preside over the Grand Army of the Republic, when the musty lodge-rooms could be packed on short notice with the real and fancied heroes of Manassas and Gettysburg, then so robust and jocular.

They tell me that not a single member of the post is able to navigate the streets alone anymore, so the county board decided to keep the basement still dedicated to patriotic service at small wages, and turned it over to the agricultural committee.

THE rooms looked strangely small and cramped to me, because as a youngster the lodge-rooms, alive with hearty repartee and martial music, and decorated with banners, crossed swords, and "honorable discharges" in gilt frames, seemed a veritable hall of national splendor. Perhaps it was fancy, and it seems incredible when the county agent's spray dope and chemical reagents are considered, but I seemed to get a whiff of fried cakes and coffee, left as a lingering vestige of the delectable suppers served by the ladies of the Relief Corps during the days of recruiting for the Spanish-American War.

Recollections of 1898 follow me outside again (after I have found out the local soil-depleting base and intentions to plant from my obliging county agent). Upstairs in the mottled lobby with wide plank flooring and a polished walnut staircase, several litigants are waiting as of yore to tackle the county judge or the sheriff on line-fence and stray-animal matters of grave import to provincial peace.

They sit in a silent circle around the spot where the august mortal remains of Judge Gaylord once rested during that same recruiting week when prodigious dinners for the belligerent Sons of Veterans nerved them to enlist for "Cuba libre." The chanting of the Episcopal ritual in the lobby blended on that spring day so long ago with the muffled pledges below stairs by the boys who shouted, "Remember the Maine, to hell with Spain!"

I EXPECTED to see the doughty old Civil War judge jump from his ornate casket and swing his tasseled sword in the fashion of the Sixties, so pregnant was the hour with swashbuckling and "sacred honor." It must have been a great sacrifice for him, just to get a few bunches of wilted flowers, a halting sermon, and a short ride to Golden Lake Cemetery—on such a sunny morning. And the blank volleys fired across his grave and echoing against scrub-oak hills, must have made him impatient to join Colonel Teddy and General Shafter in the mobilization for the Cuban invasion.

And as I pause on the roughened stone steps flanked with wrought-iron railings, I see again a husky throng of veterans seated there in rows, while a jerky gent in a brown derby hat and a baggy suit fumbles underneath a black cloth getting the proper focus for a wet-plate negative of the post members during a lull in some jolly

camp-fire reunion. My glance roves across the street through the budding elms to an open doorway of a yellow brick hall, from whence in all the trappings of blue and gold braid, with

Springfield rifles at attention, came each Memorial Day the "squads right" columns of Judge Gaylord's Guards, who discarded that honorary title for a more official one as the troops departed for Havana.

Stepping on the reluctant starter, I throw the motor into gear and ramble down the shady street, passing right along the "line of march," where I watched countless circus parades and torch-light processions, saw my first horseless carriage, glimpsed Buffalo Bill and Annie Oakley (world's greatest lady wing-shot), and cheered the Negro minstrels and the town boys who went to Cuba.

In the fifth block from the court house I pass the grade school where sundry patient teachers did the best they could for me—under the circumstances. Oh, I suppose it's no use, the sky is too blue, the air too bracing, and strong "ectoplasms" of boyhood impressions seize me on this accustomed spot. Shall I again give way to an impulse, instead of adhering to a solemn duty? Why not forget soil improvement and farm enlightenment a couple of hours, like I did my grammar, and just play hooky?

It was on this elementary campus that my earliest pleasures and discomforts mingled. The latter were fewer, to be sure, and soonest forgotten. They include minor ailments of the soul and the stomach common to grade-school pupils everywhere, such as the wistful heartache caused by an indifferent miss in pig-tails, and hurrying home frantically with a green-apple bellyache.

HERE I learned how to play marbles, fly kites, and turn handsprings, or received sly, elder-boy lectures on the origin of species before I ever heard of Darwin or biology. It was here that we underlings watched the approach of a certain gaunt, stern-visaged, high-school teacher with dread, only to become of later years in mathematics classes her devoted and admiring slaves. For on the wall of her classroom, neatly framed in a water-color border of pansies, was the motto which led us past her forbidding exterior to a warmth ineffectually concealed, "There is so much bad in the best of us and so much good in the worst of us that it allows none of us to speak ill of the rest of us."

Our graduation exercises in that turreted old building occurred 30 years ago this summer. But I presume so many new ties have been made and so many things of greater consequence have happened to my callow comrades of that humid June-time, that any crude suggestion on my part for a reunion on the anniversary would be as welcome as a donation day in Edinburgh. Most of us are too engrossed in family matters and in finding funds to educate our own children to pause

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On Apple Orchards Use "Congenial" Fertilizers

By Dr. Fred W. HofMann
Agricultural Experiment Station, Blacksburg, Virginia

RESULTS from experiments carried on over a number of years at the Virginia Agricultural Experiment Station indicate that it will pay apple growers to recognize certain beneficial interactional effects that are likely to occur in orchard soils and in certain fertilizer mixtures among different materials. In many instances the value of the respective materials has become immensely enhanced. Evidence is clear and convincing that the mixing of these materials facilitates greater efficiency by increasing their availability as nutrient solvents. Some materials containing valuable nutrient elements may remain inert and relatively of little value until they come in contact with others. It is only too obvious that both physical and chemical changes are likely to occur when the different fertilizer materials are brought together.

It has been found that the availability of phosphorus and of potassium may be significantly influenced in the presence of different nitrogenous fertilizers. Phosphorus in the soil is made more soluble with applications of either sodium nitrate, calcium nitrate, calcium cyanamid, or potassium nitrate. This also occurs when these nitrogenous materials are mixed with acid phosphate. Ammonium sulphate has the opposite effect and the phosphorus will remain fixed unless the acidity of the soil is decreased. However, ammonium sulphate increases the solubility of potassium.

Fig. 1—Apple trees the spring following an application of nitrogen only. Compare with trees in Fig. 2 which received the same amount of nitrogen and also phosphorus and potash.

Recently more attention has been directed to the influence of acid phosphate and of either potassium sulphate or potassium chloride upon some of the nitrogenous fertilizers. At various times during the past 8 years results have been reported from experiments conducted at the Virginia Experiment Station by the writer, indicating beneficial in-

fluences of these fertilizers upon ammonium sulphate and more particularly in recent years upon calcium cyanamid. A very live interest in these results is evident from the numerous inquiries that come to the writer not only from fruit growers in Virginia but from elsewhere. Because of this widespread interest the writer feels justified in presenting herewith some of these results, along with a somewhat popular discussion of what most likely takes place chemically when the materials mentioned are applied along with calcium cyanamid to fruit soils.

In 1932 near Blacksburg an apple orchard of crowded, starved, and stunted trees was selected for these fertilizer experiments. These trees were far from anything in the way of what would be expected in a well-maintained orchard. Because of their low scale of vigor and fruiting, the chances were considered more likely that the trees would show the more striking responses from the treatments. The apple trees, composed mostly of Grimes Golden, Stayman, and York Imperial, were about 25 feet apart and 20 years old when the experiment was commenced. As this was entirely an experimental lay-out that was designed primarily for the purpose of working out certain principles, the reader is cautioned to consider the rates of application in that light and very much in excess of what would be recommended in usual practice. Such experiments are justifiable as certain extreme situations are valuable in bringing out results in the more marked degrees.

On the other hand, it was also the object of this experiment to reveal what may happen when applications of calcium cyanamid are made under some conditions other than are ordinarily recommended. Applications in the different treatments per tree, one set in fall and a replicate in spring, were as follows: 1. Calcium cyanamid alone 10 pounds. 2. Calcium cyanamid 10 pounds, acid phosphate (20%) 13 pounds. 3. Calcium cyanamid 10 pounds, sulphate of potash 4.2 pounds. 4. Calcium cyanamid 10 pounds, acid phosphate (20%) 13 pounds, sulphate of potash 4.2 pounds.

Need Potash and Phosphorus

As compared to the responses made when calcium cyanamid was applied alone, those trees that received in addition either or both acid phosphate and potassium sulphate showed the better growth and yield gains. Such responses commenced the season following the application. Over a 3-year period, as compared to calcium cyanamid used alone, the results were three times better for calcium cyanamid with potassium sulphate, three and a half times for calcium cyanamid with acid phosphate, and four times higher with these three fertilizers applied together. The most marked effect was

Fig. 2—Apple trees the spring following an application of a complete fertilizer. Note the abundance of strong, vigorous, blossom clusters and the character of the new wood.

noticed in the luxuriant growth of the native ground cover under the trees, especially in those plats receiving the three fertilizers.

Many fruit growers and investigators who have visited and inspected these experimental plats have been interested in ascertaining the changes that take place when the other fertilizers are added with calcium cyanamid. Several years ago the writer referred to the ammoniation of either phosphorus or potassium that took place with the release of ammonia from calcium cyanamid. Among the products in the decomposition of this nitrogenous fertilizer are ammonia and also urea, which subsequently gives off additional ammonia.

The ammonia given off that goes into combined form is the product more quickly used by the trees and plant growth but in a free state is lethal in larger amounts. Any condition that will promote ammoniation of this free ammonia with phosphatic or potassic fertilizers will increase the value of the fertilizers not only in checking the lethal properties of the ammonia but in making all these materials more convertible into plant food.

Supporting Evidence

Recently some more investigations have been conducted showing this principle of ammoniation. Chemical aspects of ammoniation of superphosphate were presented in May 1935, as a result of experiments conducted by Messrs. John O. Hardesty and William H. Ross, Fertilizer Investigations, Bureau of Chemistry and Soils, Washington, D. C. In later investigations in this same bureau, Messrs. Frank O. Lunstrom and Colin W. Whittaker show in January 1937 the effect of ammoniation on urea component of superphosphatic mixtures.

Attention is directed to the more recent use of ammonia in the preparation of fertilizer mixtures. The ammonia is added in aqueous or anhydrous form or as ammonia solution of urea or other nitrogenous material. The addition of ammonia to a superphosphate is accompanied by a rise in the temperature of the mass, due mainly to the heat developed in the reactions between these materials. The heat, as it progressively develops during the ammoniation of superphosphate in mixtures with urea, tends toward an accelerated decomposition of the urea and a more complete ammoniation.

Beneficial Interactions

Among the products formed in ammoniation of the phosphatic fertilizers are urea phosphate, urea-monoammonium phosphate, and urea-dicalcium phosphate. All of these materials are conducive to higher growth and yield responses in the apple trees. The apple trees will also be benefited by the enhanced growth of any ground cover or cover crops supplied with such materials. When ammoniation also includes potassic materials, these responses are the more marked. In view of the superior results that have been secured, fruit growers should find it to their advantage to be aware of some of the beneficial interactions that may take place in adding phosphatic and potassic fertilizers to their nitrogenous materials. This is particularly so in mixtures with calcium cyanamid. It has been found that applications of such mixtures can be made over a much more extended season, even through the bud swell of the apple trees up to the green-tip stage.

When apple trees are booked for the on-year more attention than ever should be given to a liberal supply of soil nutrients. The more liberally fed trees will, of course, be better provided to take care of the current season's needs for the development of the fruit crop and also for the development of fruit buds. Most important of all, they will be better equipped against unfavorable weather

conditions in summer as well as winter. In a consideration of practical measures in the application of fertilizers to apple trees, inquiries come up as to the amounts and rates of mind the special needs for special situations. Of late much importance has been attached to investigations based on analyses which show how much of the essential elements are removed by

Fig. 3—With proper attention to the management of the orchard soil, volunteer growth can be utilized to great advantage in supplying relatively large amounts of organic matter. Orchard soils can be built up to an excellent organic content especially when the cover crops are given liberal amounts of a 10-6-4 fertilizer combination.

application that should be used. This depends upon the fertility of the soil, the age of the trees, and certain seasonal or emergency needs.

Fertilizer Recommendations

If the orchard soil is not strong enough to maintain a good crop of grass or sod it should receive 600 to 800 pounds of an 8-6-6, 6-8-6, or 10-6-4 fertilizer. If the soil is capable of producing a lush growth of grass or sod the fertilizer applications may be more confined nearer the area under the spread of the tree and to fertilizers with the higher nitrogen content. Bearing trees 30 to 40 inches in circumference will be benefited with a 5-pound application of a 20 per cent nitrogenous fertilizer, especially when they are booked for the on-year.

As a general proposition it should be well for apple growers to bear in the apple trees. Thomas of Pennsylvania reports analysis of apple trees grown on vegetatively propagated roots of the same clone in Hagerstown clay loam soil, half under clean cultivation and half under sod. According to this investigator's analyses, fertilized apple trees, including the leaves, contained nitrogen, phosphoric acid, and potash in the ratio of approximately 6:1:4; whereas the ratios of these three elements in the fertilizers applied had been approximately 3:8:4. These analyses are of great interest, particularly as revealing the proportion of these elements as they go into the making of apple-tree growth.

The more consequential effect of the pull of nutrient salts by the harvested fruit is generally after the 17th year in the average Virginia orchard plantings of about 35x35 feet. The computations made at this station by

the writer show that for every 100 pounds of harvested fruit .059 pounds nitrogen, .027 pounds phosphoric acid, and .16 pounds of potash are removed. This requires the equivalent of .369 pounds of sodium nitrate, or .295 pounds of ammonium sulphate, or .269 pounds of calcium cyanamid for the nitrogen; .169 pounds of acid phosphate for the phosphoric acid; and .32 pounds of potassium sulphate or potassium chloride for the potash for every 2 bushels of apples. *Thus one bushel of apples requires the equivalent of 2.96 ounces of sodium nitrate, or 2.37 ounces of ammonium sulphate, or 2.16 ounces of calcium cyanamid for nitrogen; 1.32 ounces of 16 per cent acid phosphate for phosphoric acid; and 2.56 ounces of potassium sulphate or potassium chloride for potassium.* For these fertilizers this is approximately in the ratio of 2 of the nitrogenous to 1 of the phosphatic to 2 of the potassic, or on the basis of the actual elements 2 of nitrogen to 1 of phosphoric acid to 6 of potash.

By adding somewhat above the actual removal in the fruit, a depletion that might become harmful to optimum growth and fruit production of the tree can be guarded against. Upon the basis of these removals the grower is enabled to make applications more correctly and more economically. Since experimental evidence shows the more direct responses of apple trees to complete fertilizers as the space to which they are confined becomes more root-crowded, it is reasonable to replenish nitrogen, phosphorus, and potash at some time, at least at the rate that it is removed by the harvested fruit. It appears best to make adequate nitrogenous applications to the apple tree from the very beginning. The larger part of the phosphatic and potassic applications may be withheld until about the 17th year, after which their removals will commence to be progressively more consequential; but other than as a matter of insuring a

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Fig. 4—In the background the organic content of the soil was so depleted over a 20-year period of continual cultivation that it was difficult to establish even a sparce growth of rye. The area in the foreground has been maintained in ground cover growth. Such growth between trees would add materially to the organic matter of the soil. An occasional "cracking" or tearing up to prevent fire and mouse hazard and application of a complete fertilizer insures a greater supply of food and moisture to the apple trees at the critical periods of the tree's needs.

Potato Improvement In Wisconsin

By E. A. Jorgensen
County Agricultural Agent, Wautoma, Wisconsin

HERE is a letter which might have been written by a prosperous Waushara County, Wisconsin, potato grower in the gay 90's to his relatives back East:

"Potato is King in Waushara County. Pine and oak trees are giving way to potatoes and the great, level, dark sandy soil on the Oasis prairie is rapidly being plowed for potatoes. Waushara County is first and last a potato county. The village of Plainfield will ship 2,000 cars of potatoes this year. Potato growers are rapidly paying for their farms, building fine homes, and are foremost in providing good schools for their children. They grew over 20,000 acres of potatoes this year with yields running from 200 to 300 bushels per acre. No fertilizer was needed. Potato spraying has never been heard of outside of putting on some bug poison. There are no potato grades and yet Waushara County potatoes are of high quality. All a dealer needs to say is, 'These potatoes are from Waushara County,' and then demand a fancy price."

Analyzing the Problem

You say this sounds like a fairy tale—well, it is not a fairy tale—it all happened 40 years ago. Those were the days when farmers were working with a soil that nature had taken thousands of years to build for what everybody thought was the growing of potatoes. Yes, there is romance connected with the lowly potato, dating from the days of Sir Francis Drake way down to the Warren Potato Control Act of 1935.

Today we in Waushara County are involved in a county-wide potato improvement program. Why? Because:

1. Our yields are too low for profitable production—only a scant third of what they were in the 90's. As the average yield goes down, so does the quality.

2. Our acreage has gone down steadily until today it is less than half what it was in former years.

3. The dealers say that our potatoes are below grade, therefore we hate potato inspections.

4. Consumers who have money to pay satisfactory prices for potatoes are asking for Idaho Russets and Colorado McCures. They say our potatoes are below grade and will not buy them unless they are forced to because of a great shortage, and then they are apt to pay upwards of a dollar more per hundredweight for Idaho's and Colorado's.

5. Our soil is filled with a dozen kinds of scab diseases—even seed potato treatments seem to be futile.

Can we devise a potato improvement program that will reinstate this desired cash crop? Can we regain these now lost desirable markets? Here's a challenge to the efforts, imagination, and vision of the sons and grandsons of our past potato kings.

Is it our marketing system that is

to blame? Some farmers have voiced this opinion but older men tell us that the distribution system of today is much improved over the 90's.

Is it the lack of spraying? It can't be this because sprayers were never heard of in the early days when the yields were three times those of today.

Is it our cultural practices that need improvement? Do we need better machinery? "No," even our "hay-wired" machines would have been welcomed by our grandfathers.

Is it the weather? Most of you will say "yes." We all realize that the drought of recent years has been one of the main causes of our low yields and poor quality. Yet Wilbur Larson, potato grower at Wild Rose, in Waushara County, who obtained some new seed through the County Agricultural Agent last spring, reported a yield of 275 bushels per acre. The weather wasn't any different on his farm than on a neighbor's who purchased the same seed and only obtained a yield of 89 bushels per acre.

A Successful Program

What made the difference? A visit to Mr. Larson's farm during the potato-growing season might have given the answer to the kind of program that we need. Over 10 years ago Mr. Larson was having trouble with his potatoes. At that time he engaged Professor A. R. Albert, Director of the Hancock Branch Experiment Station, to test his soil and to advise him as to its need. Since then he has been seeding deep-rooted, drought-resistant, soil-building crops like alfalfa and sweet clover and he has been stimulating their growth and their soil-building powers through the application of lime, phosphate, and potash—enough lime to nearly neutralize his soil and a 1 to 2 mixture of 45 per cent phosphate and muriate of potash applied at the rate of 200 pounds per acre before each new legume seeding. A 4- to 6-year rotation gives his potato soil a rest and thereby reduces the virulence of potato disease organisms.

Mr. Larson has, by helping nature with applications of lime, phosphate, and potash and the regular seeding of soil-building crops, done in 10 years what it might have taken nature unassisted perhaps 400 or more years to do.

High Quality, Good Yield

Frank Trickey, veteran potato grower on the Oasis prairie, has been solving many of his potato-growing problems in practically the same manner as Mr. Larson—by improving his soil. He tells me that the quality of his potatoes depends upon the yield. He maintains that a good yield of 200 bushels to the acre has always given him a high quality production whereas low yields go hand in hand with poor quality. He says that as the land gets run out and the yields go down, so does the quality of potatoes.

Each year more and more Waushara County farmers are practicing practically the same principles of soil improvement which Mr. Larson and Mr. Trickey found so successful. Potato growers are rapidly becoming convinced that most of their potato-growing problems will disappear if they can restore their soil to its original tilth, fertility, and high humus content.

The County Agent's Office, in cooperation with the Soils Department, College of Agriculture, has during the past 8 years analyzed for lime, phosphate, and potash 5,127 samples of soil from about one-half of the farms in the county. Potato growers are taking advantage of the CWA, WERA, and WPA liming programs and the present Agricultural Conservation Program in this huge and expensive soil-building venture. During the last 3 years Waushara County farmers limed over 30,000 acres through the application of 114,167 yards of marl and 9,654 yards of paper mill sludge,

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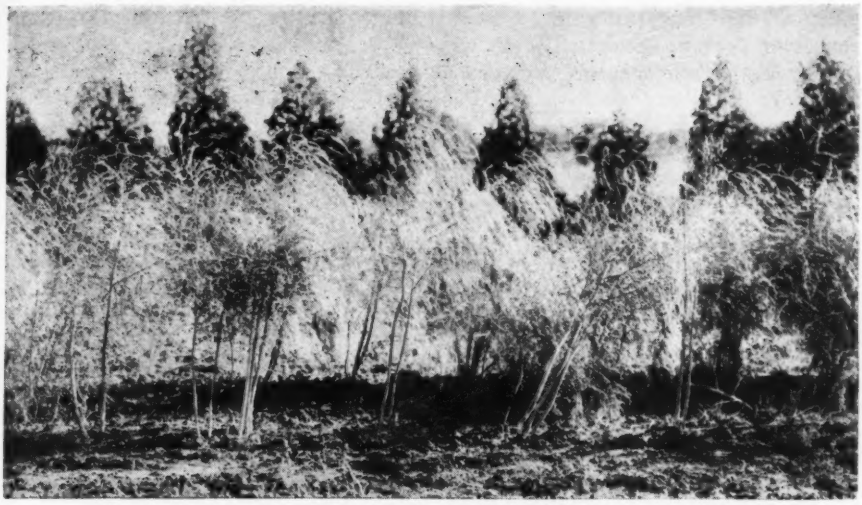


Variation in size and number of stalks of seedlings from one mother plant.

Asparagus in Ontario

By O. J. Robb

Horticultural Experiment Station, Vineland, Ontario, Canada

SUCCESS with asparagus depends on many factors, some of which are not fully appreciated by the commercial grower. Other than lack of moisture, which has affected many fields during the recent dry seasons in Ontario, probably the most serious factor limiting asparagus yields is the lack of uniformity of the plants themselves. This is evident to anyone who may take the time and trouble to record a few individual plant yields. Observation of the mature top growth during the late summer may disclose considerable difference as to number of stalks, size and height of growth, as well as the difference in sex of the plants. It is this last character which prevents the production of pure or uniform strains of asparagus.

It is not practical to propagate by division of the crown, and our nearest approach to a pure strain is the repeated selection of desirable parent plants followed by progeny tests until a nearly uniform strain can be found. This is being attempted at the Horticultural Experiment Station by the selection of high-yielding male and female parent plants followed by a progeny yield test to determine the best cross from the standpoint of producing uniform high-yielding plants.

The commercial grower is advised to select the plants at planting time. At present there is no certain means of identifying young plants as to their desirability, except that the large plants usually do better than the very small ones. It is not possible to determine the sex of 1-year-old plants, and consequently advantage cannot be

taken of the increased yield of male over female plants. Selection of plants will pay, but selection of seed from high-yielding plants which have been pollinated by the best male plants should ensure the maximum number of good plants in the seedling row. For commercial growers, the selection of seed-baring plants is not impossible.

Great variation in yield of individual plants was observed at the Station on three separate tests of plants picked at random from plots of Mary Washington which had been set with carefully selected plants at planting time. Each of these test records covered three seasons. In addition to the variation in yield which ranged from 4 to 40 marketable sprouts in one season, other factors were noted as follows: plants with low yields remained in the low class over the three periods, and the high-yielding plants maintained their relative position; few plants produced sprouts at every cutting date.

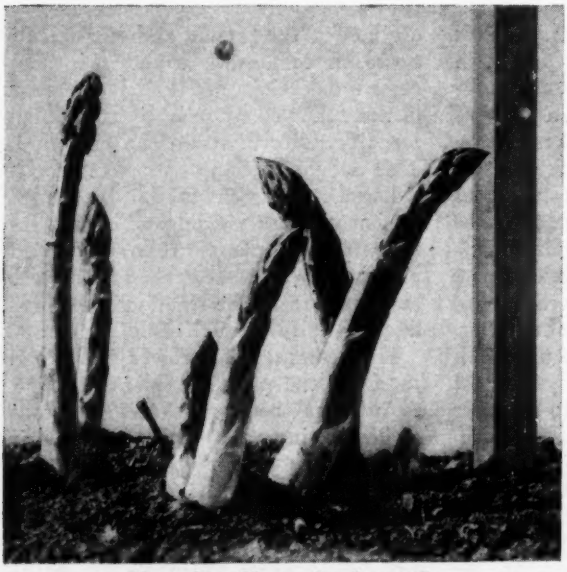
One of the most significant observations was the positive correlation between the high early yields and the high total yields. The early yields were in effect linked with the total yields. This correlation simplifies the selection of high-producing plants, as individual records for a short period at the beginning of the season will indicate the best plants.

The factor of earliness becomes more important in northern sections where the cutting season is apt to extend into and shorten a normal growth season. We can do little towards extending the growth at the end of the season, as the lower temperatures together with the shorter days of late September and early October effectively limit further development. It is at the beginning of the growth period that the season may be lengthened.

Early Season Growth

The type of soil as well as the location has some influence on the early season growth. A light sandy soil will warm up more rapidly than a low-lying heavy type. Plants in the more southern areas start into growth earlier and therefore the cutting season can be terminated earlier, thus allowing for a longer growing season.

The question of manure and fertilizer applications is very important. Much in the way of manuring can be done previous to setting the plants, and at the time of planting the partly filled furrow is a good place to apply a complete fertilizer such as a 4-8-10 analysis. Subsequent applications are usually broadcast on the surface. Nitrogen is readily absorbed at any time, and favorable results have followed its use before and during the early cutting season. Cyanamid, containing lime as well as nitrogen, is frequently used



Plants like this one break records.

Kainit was used in a weed-control experiment on the Martindale Farms, St. Catherines, Ontario. Compare the untreated field on the left with the one on the right which was treated with 2,000 lbs. of kainit per acre.

during the cutting season, mainly to control weeds.

Asparagus plants can withstand large concentrations of sodium chloride (common salt) and sometimes it is applied as a weed-killer. Kainit, which contains a low per cent of potash, may also be used to control weeds.

General recommendations of the Advisory Fertilizer Board of Ontario are to apply liberal quantities of manure and 1,500 lbs. of a 4-8-10 fertilizer at the end of the cutting season, or the manure may be applied in the fall. During the cutting season up to 500 lbs. of non-granular cyanamid may be applied to control weeds.

Depth of Planting

The depth at which the young crowns are planted has a greater influence on the early season growth than most factors. It is the normal habit of the asparagus plant to gradually extend its crown and stem (rhizome) outward and upward until the buds are formed almost at the soil surface and spread over a considerable space. The underground stem elongates and branches out more rapidly as it comes nearer the surface, thus a plant set deeply not only is slow in starting growth each season but it is also late in reaching its maximum yield. Soil conditions vary greatly, but the general recommendation to set the young plants not over 8 inches and 6 inches in depth may be more desirable in good, rich, sandy soil. The only occasions where deeper planting would be useful is on very deep, sandy soil and where blanched sprouts are desired. On the heavier soils, such as clay loams, not over 6 inches deep, and even less if the conditions warrant it, is best. With shallow-set plants it is necessary to take special care in cultivation, as the buds are easily destroyed. Very old crowns are right at the surface, and the soil is almost completely occupied by the storage roots. Decrease in yield of old asparagus plants may be due to severe injury to the buds from cultivation or freezing injury during hard winters when the soil is exposed to extreme temperatures or to over-crowding and the consequent production of small unmarketable shoots.

The distance of planting has some bearing on the early yields of asparagus plots. Wide spacing is not desir-

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From Pine Forests To Sweet Potatoes

By Ben Hilbun
Agricultural Experiment Station, State College, Mississippi

AT Laurel, Mississippi, the steady din of machinery which sounded the end of the lumber industry's heyday has been hushed. Now the almost noiseless operation of other machinery in one of the old sawmills hums the saga of a new industry that promises a lot for the rural sections, towns, and cities of the South.

It is a transformation from pine trees to sweet potatoes or from lumber to starch. The expansive forests of yellow pine have been almost exhausted, and scientists prospecting for a new vein of pay dirt think they have found it in the lowly sweet potato which grows abundantly in the warm, loam soils of the Coastal Plains area.

U. S. D. A. chemists formulated the process of extracting high-grade starch from sweet potatoes in an effort to establish a stable market for this farm product. For years farmers had been requesting the Department of Agriculture to find a market for their surplus yields, and this plant, made possible in 1934 by the Government's allocation of $150,000 for its construction, is the answer.

Removed Discoloration

Sweet potato starch is not a new product. It has been produced in Japan for a number of years, but discoloration limited its use. Chemists sought to remove this objection of industrial concerns that require a fine grade, white, cereal starch for various purposes.

The first starch plant erected in the United States was built at Thibodaux, Louisiana, in 1928. Irish potato starch machinery was used, and the "off color" in the finished product caused the project to fail.

Chemists by 1934 had apparently solved the problem of removing from sweet potato starch the coloring which had made it objectionable to manufacturers, and Department officials proposed to Government officials an experimental plant at Laurel. The money for the renovation of the building and the installation of machinery was provided.

Producing Starch

The plant handles the ordinary field-run potatoes in keeping with the objective of research workers to find a method of converting the non-marketable potatoes into profitable products. Everything from three-fourths inch up, including cut, bruised, and cracked potatoes, are accepted just as they come from the field.

When received, the potatoes are weighed and unloaded into bins, from which they are fed into a flume which conveys them into a washer. The washing is continued under power sprays until the last particle of dirt has been removed.

An upright elevator lifts them to the second floor, where they are automatically fed into rapidly-revolving grinders. To separate coloring matter

which might contaminate the starch, a chemical solution is added.

The mixture is then fed onto screens for separation of the starch and pulp. The pulp passes through an hydraulic press which squeezes the water out, and is afterwards conveyed to a dryer from which it emerges as the finished byproduct.

Starch milk forced from the pulp is fed onto tables or troughs. Being heavier than water, the starch settles on the tables, while the water, small particles of pulp, and other foreign matter drain off. The starch is removed and finished for market.

Possibilities of the industry are emphasized by the approximately 300,000,000 pounds of root starches that are imported annually. They consist chiefly of white or Irish potato, and Cassava or tapioca starches that originate mainly in the East Indies. The Cassava gets its name from the root from which it is produced.

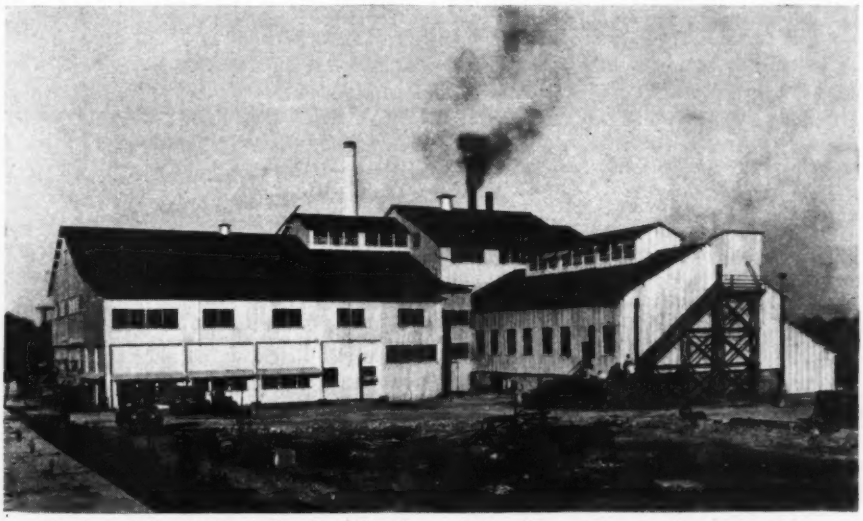
High-grade root starches, because of their peculiar properties, are required in various manufacturing processes. For example, white potato starch is imported and used to a great extent in warp-sizing and finishing fine cotton textiles. Cassava, also an import, is used in the manufacture of adhesives for stamps, white envelopes, furniture veneering, and for food purposes.

Tests have shown rather conclusively that sweet potato starch produced at Laurel meets the requirements of several industries that have heretofore relied wholly on imported products. About 1,000,000 pounds of starch have been made in the Laurel plant in its 3 years of operation, and most of it has been used in the textile industry for warp-sizing and finishing cotton goods. The results, according to the operators, have shown less shedding, less loom stoppage, and better feeling cloth, all of which contribute to lower production costs.

Variety of Uses

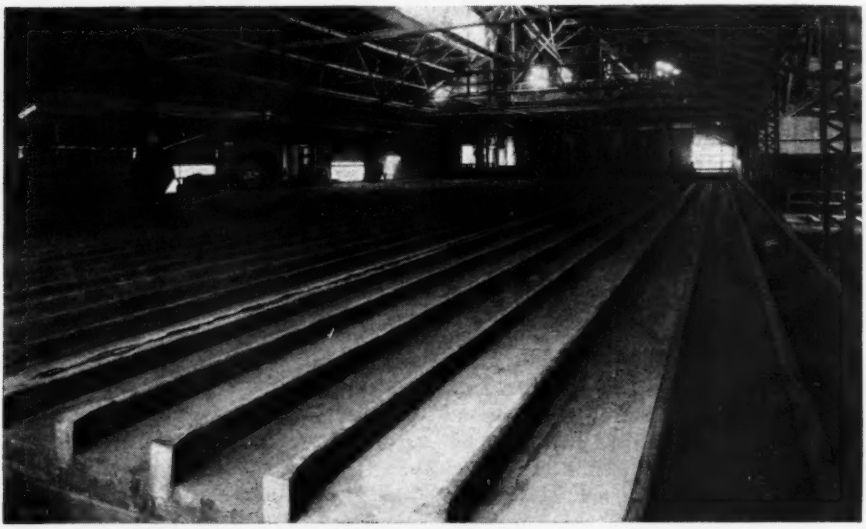
Factory scale tests have been made in sizing and finishing paper and as an adhesive in the manufacture of paper bags, laminated wood, and wood veneer. It has also been used with good results in baking, confectionery, and commercial laundry work. It has no superior as a home laundry starch.

The Laurel plant, which has been deeded to the Mississippi Experiment Station, is leased to a cooperative or-



The Laurel Starch Plant, showing unloading and elevating potatoes to the storage bins.

ganization of farmers, 51 per cent of whom are being rehabilitated. It has a capacity of 200,000 bushels of potatoes for a 100-day season, and if run at full capacity for this period of time it unprofitable to transport them long distances for the manufacture of starch. The raw product supplied the Laurel plant is grown close enough to be trucked or shipped in from rela-



Starch tables or troughs onto which the fluid starch milk empties.

the output of starch would be 2,000,000 pounds.

In 1934, the first season it operated, the plant made 140,000 pounds of starch at a cost of 13 cents per pound, raw material included. The 250,000 pounds made in 1935 were turned out at 10 cents a pound, while the 420,000 manufactured in 1936 cost, roughly, 3 cents a pound. To operate the plant requires 52 men working in three 8-hour shifts.

Large Demand

It is estimated by officials of the Bureau of Chemistry and Soils of the U. S. D. A., who direct the chemical and technological work of the plant, that it would require 150 plants the size of the Laurel plant to manufacture as much root starch as is imported. To do this would require an expenditure of about $75,000 for each plant.

The weight of sweet potatoes makes tively short distances. Therefore, if the sweet potato starch industry, now in its infancy as a commercial enterprise, develops to maximum possibilities, additional plants must be built in convenient locations in the sweet potato belt.

Farmers can count on at least 20 cents per bushel for either culls or the entire crop. Twenty cents a bushel is not a high price for marketable potatoes, but it is not so bad considering the fact that little, medium, and big potatoes are acceptable. Also, they can be plowed up, loaded directly into the wagon or truck, and unloaded at the plant. No preparation is necessary.

Many members of the cooperative association that has the Laurel plant leased, supplement the cotton crop with sweet potatoes. One farmer, J. H. Bush, averaged $71.68 per acre for his crop in 1935 as compared to $32.74 an acre for cotton grown on

similar land. Another, Carl Moss, got $26 for his harvest on three-fourths acre. Still another, S. F. Vaughn, netted $40.03 per acre on 10 acres after deducting fertilizer, plant, harvesting, and hauling costs.

A systematic survey of 103 commercial growers made in the Laurel area in 1934 revealed an average total yield of 200 bushels per acre. In 1936, an extremely dry growing season, 250 growers who had contracts with the starch factory averaged 151 bushels per acre, yields on individual farms averaged from 49 to 492 bushels per acre. Fertilizer applications on these farms ranged from 100 to 1,100 pounds per acre, and averaged 480 pounds per acre.

Most Productive Strains

Sweet potato production in the United States averages around 75,000,000 bushels annually. Most of this amount goes for food and feed, and only the small part now being manufactured at Laurel turned to the production of starch. It is known that sweet potatoes are grown on more than half the farms of the South, with production centering in North Carolina, Mississippi, Alabama, Georgia, Louisiana, and Tennessee.

Extensive variety tests have been carried on by the horticulturist of the Laurel plant, the object in view being to increase the production of starch per acre by finding the variety that has the highest starch content. A total of 64 varieties have been tested during the last 2½ years. In addition to standard southern varieties, these tests included varieties and strains representing importations, selections, and seedlings introduced by the Department of Agriculture.

Previous experimentation has dealt largely with the adaptability, storage qualities, yielding ability, palatability, cultural practices, and fertilization. Nothing had been done toward ascertaining the amount of starch they contained or the influence upon starch content of soil type, fertilizers, or cultural practices, until the manufacture of starch was initiated at Laurel.

Although this work, like other phases of the commercial aspects of the plant, is new, 10 southern varieties of sweet potatoes have been found superior in plot tests run at Laurel in 1936.

Here are the results of the 1936 tests:

Variety	Yield Bushels	Starch Content Per Cent
Miss. Blue Stem Triumph	308	24
Wennop (from Australia)	303	27
Pierson	293	26
U. S. 95984	279	21
Miss. Green Stem Triumph	275	25
U. S. 85985	275	21
Norton	267	28
Nancy Hall	252	22
Porto Rico	244	21
Southern Queen	212	23

Production of starch at Laurel has introduced a byproduct that is high in carbohydrates. From a bushel of potatoes the finished products are about 12 pounds of starch and about 6 pounds of dried potato pulp which is a good feed for cattle and sheep.

Feeding experiments at Mississippi State College show that potato pulp, when mixed with cottonseed meal which is high in protein, makes a feed that is about 95 per cent as valuable as crushed corn and beet pulp for milk and fat production.

While Japan makes about 40,000,000 pounds of sweet potato starch a year, the natural color, which the Japanese have made but little effort to remove, limits its use for industrial purposes. In fact, before testing starch from the Laurel plant, industries had little faith in its ever having a chance to replace most of the 250,000,000 pounds of cereal starch imported annually.

Chemists have shown that sweet po-

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Apply Boron to Prevent Darkening of Turnips

By Ralph W. Donaldson
Extension Agronomist, Massachusetts State College, Amherst, Massachusetts

DARK center or brown heart of turnips has been a serious problem for some years to growers marketing this crop. Crops exhibiting apparently normal growth and yield reveal no external evidences of this trouble, the presence of which is only detected by cutting open the turnip. Absent in some crops, but present in others, the number of turnips affected may vary from nothing to 100 per cent dark centers. The lack of any definite external symptom for detecting sound from affected roots, renders marketing of any but comparatively clean crops unsatisfactory.

Effects of Disease

Cross sectioning an affected turnip reveals a mottled discoloration of cell tissue having an appearance of darkened water-core areas. In less severe cases, such areas more frequently occur near the root and then in the top half of the turnip. Depending upon the severity, a cross section may show only a small portion discolored, or involve the entire area of parenchyma tissue inside the turnip. In more advanced stages the turnip becomes punky. Objectionable to the housewife, dark center turnips cut less crisply when fresh, seem more woody on cooking, and may be off flavor. Tradesmen discriminate against handling lots containing even a small percentage showing dark centers.

Known as brown heart in Canada and first reported in their literature in 1910 and by Maine experiment Station in 1914, occurrence of this disorder is now recognized at least in eastern sections of Canada, New England, and British Columbia. It was the serious losses due to its prevalence in turnips sold in New England markets in 1928 that prompted Canadian efforts for its control.

Already a problem at that time with some growers in Massachusetts, it was known by them as "dark center." Since then it has been found to occur on most soils of the State, ranging from the heavier glacial till soils of the Berkshires to the water-laid sandy soils of Cape Cod.

In Massachusetts, dark center is common only in the rutabaga varieties or smooth-leaved type; observation indicating that some strains may be more susceptible than others. For instance, dark center has rarely occurred in one section of the State where Macomber, a locally produced strain of white-fleshed rutabaga, is grown. When grown in a test trial with a yellow-fleshed strain this past season, Macomber produced a 100 per cent clean crop, while the yellow-fleshed variety showed every turnip to be dark center. Apparently also the rough-leaved or true turnip varieties are least susceptible to dark center.

Evidence of dark center trouble may not appear until the roots are well grown, often developing rapidly between early and late stages of harvesting a crop. Moreover, growers

report more trouble during certain seasons than others. In fact, presence or absence of dark center has varied considerably, apparently due to the particular plot of ground, the season, time of harvest and, the strain of seed used.

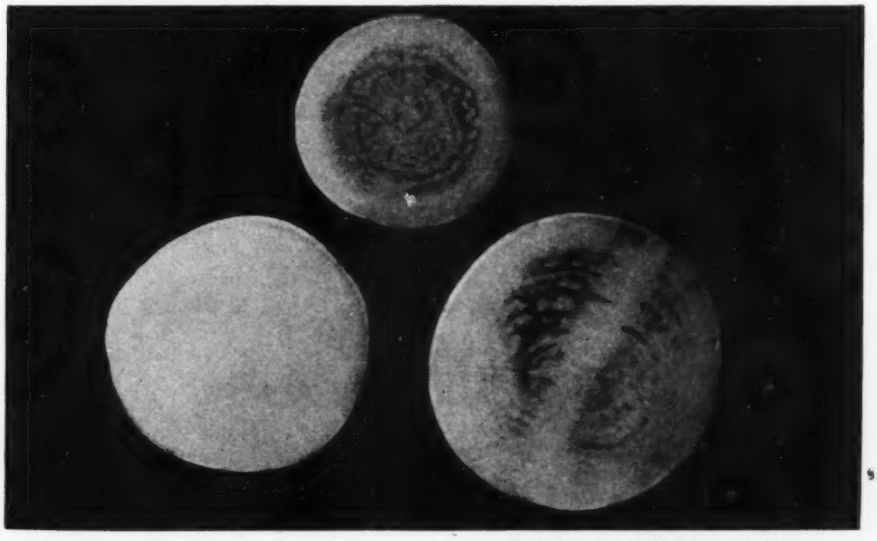
Field trials of ordinary amendments such as lime, manure, and fertilizers begun in Massachusetts in 1928 failed to give control. Neither was moisture control relationship under laboratory conditions a complete answer to the problem as determined by G. B. Snyder of this station.

Early Discoveries

From these earlier trials, the only points of significance were: that clean turnips resulted in spots (1) where seaweed was used in abundance from pitting, (2) where raw subsoil was brought to the surface from a previous year's ditching, and (3) from leachings of large manure piles.

A definite clue that boron deficiency was the cause of dark centers was first obtained from trials with raw elements, carried out by Dr. D. J. MacLeod of the Dominion Experiment Station, Fredericton, New Brunswick, Canada, in 1933. Boron gave clean centers. Following this discovery, other Canadian stations using sodium tetraborate (borax) applied in dry form directly in the hill, found satisfactory control usually from a 10-pound rate per acre. Dr. J. A. Chucka, Maine, reported gratifying control of dark center from borax during the seasons 1934 and 1935, with indications of some control from seaweed.

During 1936, 10 growers in five counties in the State cooperated with trials of borax treatments on 100 acres of turnips. In these trials sodium tetraborate ($Na_2B_4O_7 \cdot 10H_2O$ 99.5%, powdered borax) was applied, in some cases sprayed after germination along the rows, and in other cases drilled before seeding along the row with a Planet Junior. Amounts of borax used varied according to the farm, ranging from a low rate of 7 to 10 pounds, a medium of 15 pounds, and a higher rate of 30 pounds, both drilled or sprayed at these rates.



© Eastern States Farmers Exchange.

Rutabaga roots showing normal condition on left, "dark center" showing in ones top and right.

Results of these tests all showed definite benefit from borax applied. Practically perfect control of dark center was obtained, and no injury at seedling stage was observed in those cases where 15 or 30-pound rates were applied when sprayed or drilled. In most cases, the low 7 to 10-pound rate was insufficient, affording only partial control. Mention of several trials is given.

Both 15 and 30-pound rates of borax were sprayed on an entire 11-acre field on Brookvale Farm, Windsor, on heavy soil thoroughly manured and fertilized with 500 pounds of 4-16-20 per acre. A 4-row traction sprayer was used applying the borax in solution just after emergence of the plants. In former years this field had usually produced good yields, but unsatisfactory quality due to dark centers resulted in only two carloads out of 15 marketed in 1935. This year the borax treated rutabagas were not only free of dark centers, but also possessed a quality texture noted both by the owner and the market man. No difference between the 15 or 30-pound rates could be noted, but untreated check rows ran one-third dark centers—a portion unsatisfactory for market purposes.

A 10-pound rate of borax applied as a delayed spray in another trial in Plymouth County after the roots and tops were well formed was used. At harvest, untreated rows showed 100 per cent of the turnips (rutabagas) badly affected with dark center. In this case, sprayed rows showed reduction to 40 per cent of roots affected, and in these the degree of injury was noticeably less. While this delayed application helped, evidently it was either applied too late in growth stages of the turnip or insufficient amount of the borax was used to give full control.

Results obtained from drilling borax are cited for two Cape Cod growers. In the one case, excellent results followed the use of at least a full 10-pound rate drilled along the row. Eighteen acres treated in this way gave entirely clean turnips on land which commonly gives trouble, and in the previous year dark center was so bad as to occasion several thousand dollars' loss on the crop. Other control tests on this farm, were carried out, in which borax was drilled in 6 varying rates from 10 to 26 pounds per acre. All treatments gave uniformly good results of clean turnips with no symptoms of injury on seedling growth observed even from the heaviest amount. Untreated rows showed dark centers in more than 75 per cent of these turnips. However, this grower says he will use a 15-pound rate for drilling another year to be certain.

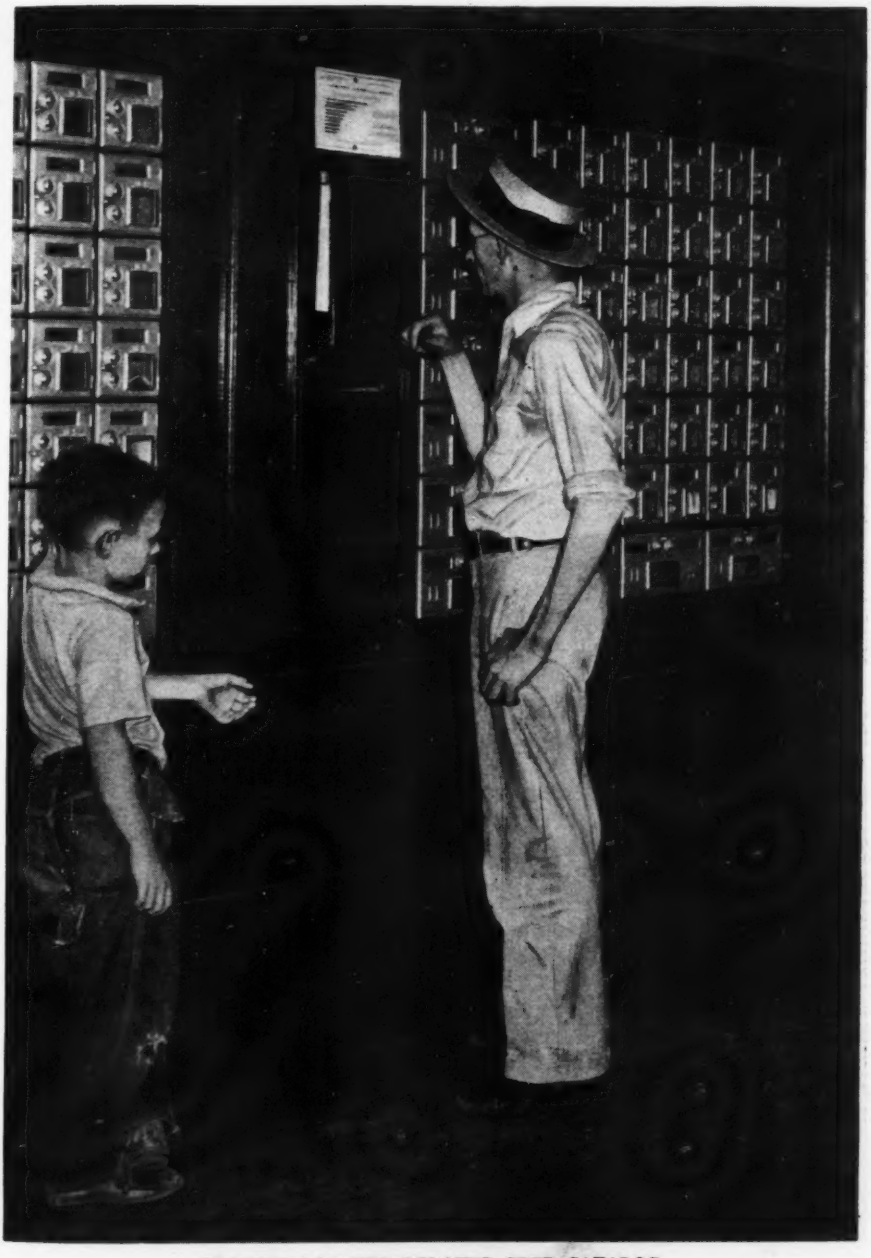
Apply Proper Amount

The largest turnip grower on the Cape (25 acres) drilled borax for a 10-pound rate, but feels certain that less actually was delivered. About 15 acres were thus treated with a few rows left as checks, but with no buffer rows. At harvest time, inspection showed some evidence of dark centers on all the area, but affected tubers were not severe cases. Actual counts revealed no significant improvement of treated over check rows. However, one field especially bad last year received a double rate of borax this year, and here alone of his entire crop did we not find a single evidence of dark center. Unfortunately no check rows were left on this particular field.

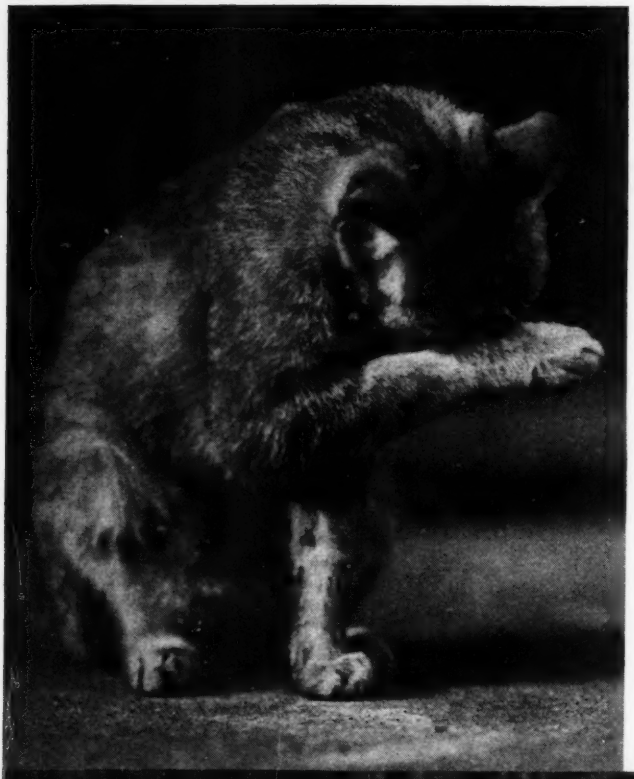
Another field, however, which produced relatively clean turnips last year, received no borax this season, and here we found the worst trouble, about 75 per cent affection, and the most advanced stages of dark center. In discussing results with the owner the evidence suggested that—borax had been positive control applied in

(*Turn to page* 36)

PICTORIAL

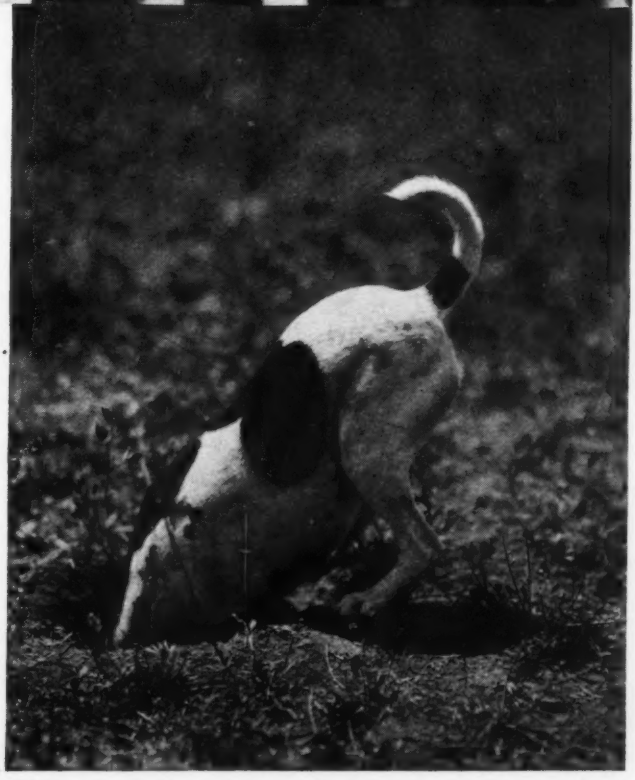


LOOKING FOR THE DELAYED SEED CATALOG.



Left: A good rat exterminator cleans up after a campaign.

Below: Contented calves make contented cows, or vice versa.



Above: A friendship which will mean good team work later on.

Right: Her name is "angel," but she's heading the wrong way.

DANCING MAY.

The Editors Talk

Returning Plant Food

Not all of the plant food lost from the farm can be laid to produce and livestock sold, leaching, and erosion. A large, but unestimated, share disappears with the crop of summer visitors which will soon descend upon farmers. The relatives, near and distant, and the urban friends and acquaintances who find summer week-ends a most opportune time to run out into the country and see "Bill and Mary" are a strain, not only on the country's natural hospitality, but upon its natural fertility. Somehow or other the guests always arrive in time for dinner and return home with cars well filled with fresh garden truck which "just doesn't cost Bill anything to raise" and is "so highly appreciated" in town.

A recent news item, given suitable publicity, might do much to correct this evil. Presents of fertilizers instead of food delicacies to country cousins are being urged by the Latvian Minister of Agriculture as a means of increasing the country's foodstuffs supply, according to a report from Consul William L. Peck, Riga, made public by the U. S. Commerce Department.

The Minister has made a number of such appeals to urban dwellers having relatives in farming districts or who contemplate spending vacations on farms to take or send small bags of fertilizers instead of the gifts usually found in vacation or week-end luggage. "This year," the Minister states in his appeal, "must be a bumper crop year," and he suggests that those who wish to eat well on vacations, or who care to bring back fresh vegetables, will be well repaid for carrying out the idea.

The Union of Farm Cooperatives is making small bags of fertilizers readily available to all who wish to participate in the unique plan, the report states.

Feeding Humans Minerals Through Better Foods

Animal nutrition research has long been under way and has been of vital interest to livestock men. More recently this research has taken a turn to include soil and crop specialists in the possibility that minerals can be fed to cattle more economically and efficiently through the growing plant than in any other way. The article, "Feeding Cattle Minerals Through Better Pastures," by N. J. Thomas in our April issue, reported recent work in this direction.

Another great field of research interest is now being stimulated by published references to the work of Dr. Charles Northen, who turned from doctoring the sick to doctoring sick soils, confident that therein lies the most economical and efficient means of treating many human nutritional ailments.

It has been said that 99 per cent of the American people are deficient in some of the minerals which guarantee full nourishment. It is Dr. Northen's belief that soils must contain ample amounts of these minerals in order to insure a resultant balanced mineral content in plants and animals, and that for any mineral necessary to human metabolism and health to be efficiently appropriated by humans, it must be present in food form. Therefore, health building must start with soil building.

Of the relationship between vitamins and minerals, he has asserted that while vitamins control the body's appropriation of minerals, in the absence of minerals they have no function to perform. He points out that two food products may look alike and taste alike and still vary widely in their mineral content, owing to the variance in the mineral content of the soils from which they were grown. He has been credited with doubling and redoubling the mineral content of fruits and vegetables; improving the quality of milk; causing hens to lay eggs richer in the vital elements; and by scientific feeding, raising the food value of potatoes, grapes, oranges, and other crops.

It is difficult for the mind to register the possible changes which might develop from further research along this line. For instance, would our entire system of grading and pricing food products be involved? What would occur in our practices of soil fertility building and maintenance? Would our race take on noticeable increases in vigor and span of life? Time alone will tell.

Consult Your County Agent

So common has the advice to "consult your county agent" become in agricultural circles that it must often reach outside circles and occasion a bit of wonder at the power of the county agent. No more fitting explanation can be found than that given in a tribute to the county agent by C. B. Smith of the Extension Service.

Within 25 years, Mr. Smith says, the county agent has risen from an almost unknown factor in rural affairs to a place of commanding importance. Looked upon at the outset as a theorist and impractical, county agents—both men and women—have come to be the trusted counselor and guide to more than 4,000,000 farm people. County agents have risen to this position, not because they have something to sell or a theory to teach, but because they help farmers increase their incomes and get more out of life.

County agents have grown strong because they carry honest, unbiased, and, as far as they know, accurate information to the people they serve. They have grown strong because, in carrying on their work, they help rural people to see larger, think more deeply, and act in the light of facts which farm people themselves help gather and help interpret.

The man who looked askance at county agents 25 years ago seldom undertakes any large matter affecting either his farming or his home today without consulting his county agent. County agents have become an influence in rural life on a par with the great inventor, the great teacher, or the press. They are comparable to the great statesman. The county agricultural agent or the home demonstration agent is recognized as one who knows what to do about local problems or can find out and then do something about them.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

The changing conception of the proper fertilization of cotton is exemplified in Bulletin 196 of the Georgia Experiment Station by R. P. Bledsoe, S. V. Stacy, and J. J. Skinner entitled, "Cotton Fertilizers for Georgia Soils." As a result of 8 years' experimentation on 5 typical cotton soils, the conclusion is reached that under average conditions the fertilization should supply 32 lbs. of nitrogen, 32 lbs. of phosphoric acid, and 32 lbs. of potash, or a 1:1:1 ratio.

The authors point out that the recommended amount of plant food may be supplied in 500 to 600 pounds of a 6-6-6 fertilizer per acre or 400 lbs. of 4-8-8 with a nitrogen side-dressing to supply 15 to 20 pounds of nitrogen per acre or by the application of 400 lbs. of 4-8-4 and a nitrogen-potash top-dresser supplying 16 pounds per acre each of these plant foods. These data are supported by the results of fertilizer demonstrations conducted for two years by the experiment station on 49 farms of the state. In these demonstrations the fertilization was brought up to approximately a 1:1:1 ratio by adding nitrogen and potash to the farmers' ordinary fertilizer practice. The yields produced by the 1:1:1 ratio were compared with those produced by the farmers' fertilizers. The yield of seed cotton was increased on an average of 192 lbs. per acre from the extra nitrogen and potash, producing a profit of $5.38. The authors point out that these recommendations are made for average Georgia conditions and should be modified to meet special conditions. For example, it was found that the Limestone Valley bottom soils respond profitably to 64 lbs. of available phosphoric acid per acre. On many of the sandy loam soils of the state more potash will be found profitable. This is also true where the soil has been limed. For extreme conditions where the cotton plant has indicated the need for more potash in the form of cotton rust, a top-dressing of 100 to 200 pounds of muriate of potash will pay. Where non wilt-resistant cotton varieties are grown on wilt-infested land, a broadcast application of 150 to 200 lbs. per acre of muriate of potash over the land before planting is advisable. The authors say that it will probably pay to use more than 600 lbs. of a 6-6-6 fertilizer in some cases. On good soils and where good farming methods are used, the amount of fertilizer used might well be raised to 700 or 800 lbs. per acre.

A section of the bulletin discusses the advantages of using high-grade fertilizer. The proper placement of fertilizer in order to obtain best results is also discussed. The best placement appears to be in a band along the row 2 inches or 3 inches away from the seed, a little below the level of the seed. Machines have been developed which do this, combined with seeding. Unfortunately, they are seldom used for cotton partly owing to their rather high cost.

"Georgia farmers are interested in

cotton fertilizers, for they are a large item in the cost of cotton production," and the authors believe that any possible economy in the purchase of fertilizer or any change that would give a higher return on the fertilizer investment would greatly benefit Georgia farmers. The facts presented in this publication appear highly practical and no doubt Georgia farmers can definitely increase the efficiency of cotton fertilizers and thereby increase profits when proper use of these data is made.

Two sources of practical information that will prove of much timely value to farmers in Michigan and North Carolina are Michigan Extension Bulletin 159, "Fertilizer Recommendations for 1937," by the Soils Department, and North Carolina Extension (Agronomy Information) Circular 103, "Suitable Fertilizer Mixtures for Different Crops . . .", by W. H. Rankin. Very similar releases are issued by these state services each year to aid farmers in determining their fertilizer requirements. As in the past, the Michigan bulletin lists in simple chart-form the fertilizer analyses and rates per acre recommended for the different crops to be grown on sand, sandy loam, loam, silt loam, clay loam, and muck soils. Among the mixed fertilizer analyses recommended for use in Michigan are: 2-14-4; 2-12-6; 4-16-8; 4-10-6; 3-12-12; 3-12-15; 2-8-16; 0-10-20; and 0-8-24. These recommendations are based on the results secured from the experimental fields in all parts of the state. The North Carolina Circular gives fertilizer recommendations for different crops according to the state provinces and soils. The suitable fertilizer mixtures for such crops as cotton, corn, tobacco, etc., include 4-8-4, 2-10-4, 5-7-5, 3-8-6, 5-7-7, and 4-8-8. This circular describes briefly the functions of the chief plant nutrients contained in fertilizers, which should enable growers to understand more clearly the purpose of and reason for using the various plant foods. Although eight or more mineral elements are required for normal crop growth, according to the authors most soils contain sufficient amounts of these in available forms with the exception possibly of nitrogen, phosphoric acid, and potash, and in some instances, magnesium, calcium, sulphur, manganese, and chlorine, although most of these minor nutrients are supplied in the regular fertilizers.

"Report of Studies on the Control of Cotton Wilt and 'Rust' or Potash Hunger," Agr. Exp. Sta., Fayetteville, Ark., Data Sheet, Feb. 17, 1937.

"A Study of Ammonia and Nitrate Nitrogen for Cotton. Part III, Influence of the Nitrogen Concentration in the Nutrient Medium. Part IV, Influence of Boron Concentration," Agr. Exp. Sta., Experiment, Ga., Bul. 197, *Jan.* 1937, *K. T. Holley and T. G. Dulin.*

*"Phosphate Investigations in Montana—*1936. *Section I, Tests with Alfalfa and Other Farm Crops. Section II, Phosphorus Responses on Potatoes," Agr. Exp. Sta., Bozeman, Mont., Bul.* 334, *Feb.* 1937, *Jesse Green.*

"Investigations on the Mechanical Application of Fertilizers for Cotton in North Carolina with some Results for Other Crops Obtained in Other States," Agr. Exp. Sta., State College Station, Raleigh, N. C. Cir. 104, *Feb.* 1937, *Emerson R. Collins.*

"Relative Value of Different Brands of Sodium Nitrate in Cotton Production," Agr. Exp. Sta., Clemson, S. C., Cir. 56, *Feb.* 1937, *H. P. Cooper, E. E. Hall, W. B. Rogers, R. W. Wallace, and R. L. Smith.*

Soils

Pennsylvania Agricultural Extension Circular 171, entitled "Soil Management in the Orchard," by J. L. Mecartney, contains much useful information that should materially help fruit growers with their orchard programs. Among the important topics comprising a large part of this instructive circular is the method of fertilization recommended for the different tree fruits grown in Pennsylvania. Every program of orchard soil management must consider organic matter as well as the fertilization of the trees since it produces a more spongy soil which rapidly absorbs rainfall and increases the rate at which soil nu-

trients are made available to the plant. The value of using quickly available nitrogen to produce more vigorous tree growth and the proper time and method of fertilizing the orchard are explained. Legumes for use as a cover crop or sod in the orchard are favored over non-legumes because of their relatively high content of nitrogen. The legumes in common use in Pennsylvania orchards are alfalfa, sweet clover, soybeans, red clover, and alsike. Since applications of lime, phosphate, and potash for the orchard are mostly effective on the sod or cover crop, complete fertilizers carrying nitrogen in quickly available form may be used in the cultivated orchard, applied usually when the cover crop is seeded. The author emphasizes that no single general recommendation will suit all conditions.

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"*Better-balanced Farming for the Oklahoma and Texas Wheat and Grain-Sorghum Area,*" *U. S. D. A., Washington, D. C., Reg. Inf. Series, SR Leaflet* 102.

"*Agricultural Conservation in Nevada,*" "*Agricultural Conservation in Utah,*" "*Agricultural Conservation in Washington,*" *U. S. D. A., Washington, D. C., Reg. Inf. Series, WR Leaflets* 102.

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Crops

"Raspberry Growing in Massachusetts," is the title of Mass. Extension Service Leaflet 48, by Professor Ralph A. Van Meter. The chief points outlined for raspberry growing begin with building up the soil to a high level of fertility before planting and the selection of disease-resistant varieties. Planting disease-free stock either very early in the spring or autumn is very important, the leaflet directs. A cover crop planted in late summer will aid in checking growth. Other points that should be looked after are keeping the rows narrow at the bottom, eliminating common pests before the population builds up, and studying the plants and adjusting cultural operations to secure a clean, vigorous and productive growth. The merits of the different red, black, and purple varie-

ties are described. Each has certain advantages over the others in the section where it is best adapted to the requirements of growers. The systems of culture for the different raspberry types are briefly discussed. Animal manures and commercial fertilizers have proved very valuable in supplying the plant-food needs for this crop. The standard 5-8-7 mixture at the rate of 500 to 800 pounds per acre, depending upon the soil, appears the best fertilization practice at the present time. The time to apply the fertilizer is early spring before growth begins. As stated above, cover crops should be sown when cultivation is discontinued. In addition to checking cane growth, they also serve to discourage weeds and to cover the soil during the winter. The care of the raspberry plants during the first season, methods of pruning, cultivation, harvesting, and descriptions of diseases and insect pests with their control are other points discussed in this interesting publication.

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Economics

Active interest in current problems of land use led the staff of the Iowa Experiment Station to a study, the findings of which are being presented in research bulletin No. 209, "Economics of Agricultural Land Use Adjustments," by Rainer Schickele. In order to treat the subject thoroughly from every angle, various departments of the Experiment Station cooperated in formulating a sound agricultural policy for Iowa, and then to bridge the gap between theory and practice, these conclusions were subjected to the criticism of a selected group of Iowa farmers. Highly interesting and usable information resulted, making the bulletin of value to a wide range of agricultural workers and practical growers.

"The ultimate goal of agricultural policy is to provide a secure foundation for the sound development of farm life," the author points out. Two crucial problems of adjustments to keep this policy in line are (1) unbalanced production relative to the demand situation and (2) soil wastage. The major issues involved in the development of a long-time program of fundamental land use adjustments in the Corn Belt are: "(1) Introduction of soil conservation as a major objective of agricultural policy and the correlation of this objective with orderly production; (2) Establishment of suitable standards of land use and soil management adapted to regional and local conditions. Historical bases for acreages of specific crops should be avoided as they tend to 'freeze' acreages and production according to a pattern incidental to a few base years and are wholly inadequate for a great number of farms; (3) Differentiation of adjustments between regions as well as between individual farms within each region on the basis of land types. This differentiation should be determined largely by the requirements of soil conservation and such factors as alternative opportunities for various products in a given region, and comparative advantage of various regions for a given product."

In order to more fully understand and to facilitate the study, Iowa was considered not as a whole, but from the standpoint of the various types of farming areas within the state. The acreages of the various crops, such as intertilled, hay, and pasture, were considered for each area, as well as the movements of feeds and grains between areas. In some areas, adjustments in land use were comparatively simple, while in others the problem was extremely difficult. For instance, in southern Iowa farmers were more

conservation-minded, and the acreage of intertilled crops such as corn had been held to the minimum in order to maintain the soil fertility and check erosion. In this area the farms were small and the percentage of intensive crops was already low. It would be extremely difficult to lower the acreages of the more intensive crops from a historical base, because any further reduction would reduce farm income and create undesirable living conditions. In the grain-farming areas the limiting factor was the high rate of tenancy.

While there is more than one method of soil conservation, such as withdrawal of land from cultivation, changing of crop systems, terracing, strip-cropping, etc., the study dealt primarily with the changes in crop systems in the direction of less intertilled crops and more grasses and legumes. Corn, obviously the most important crop in the Corn Belt, is also the most exploitative grain crop from the viewpoint of soil fertility. It removes large quantities of plant foods, fosters erosion, and exhausts the organic content of the soil more quickly than any other crop. It appears inevitable that the Corn Belt will sooner or later face a serious problem of soil conservation, and such is already the case in large sections.

It was pointed out the soil conservation attainable through a judicious use of crop rotation was necessarily limited to the maintenance of the nitrogen and organic content of the soil and to the retention of the soil itself. Minerals are inevitably lost wherever any crops are harvested or livestock is pastured, regardless of the rotation. Minerals can only be fully replaced by application of commercial fertilizers. However, the objective of soil conservation under the study was not a complete replacement of all plant nutrients removed by crops, because of minerals being released by the gradual decomposition of the soil constituents, and nitrogen being added through rains and bacterial activities, nor was this replacement necessarily economical. The questions to be considered are: (1) The character and natural fertility of the soil, (2) the rate of plant food removal through crop systems, and (3) the price relationship between farm products and fertilizer.

The author states that one of the most difficult problems of any soil conservation policy is to accomplish an adequate regional allocation, in terms of public funds and human efforts employed. Soil conservation as an objective of public policy is of a relative rather than absolute character. Instead of diffusing available funds over wide regions regardless of the various land classes and their relative need for conservation, such funds should be concentrated upon those land classes where conservation is most urgent in the interest of public welfare. The research activities in the field must necessarily transgress the lines of specific departments. They must include particularly the cooperative efforts of workers in agronomy, animal husbandry, and economics.

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"Conservation of the Soil"

ANOTHER step forward in fulfilling a great need for practical information on the problem of soil erosion induced by wind and water is presented in a new book, "Conservation of the Soil," by Professor A. F. Gustafson, Professor of Soil Technology, Cornell University (McGraw-Hill Book Co., Inc., New York, $3.00). A lifelong devotee to the study of controlling erosion, dating back to his early boyhood when he experienced the toil of replanting corn which had been washed out by heavy thundershowers, the author possesses a thorough understanding of the subjects treated. The book gives data on soil losses under various conditions in different parts of the country and on the relative success of control methods. Maintaining high soil productivity and a protective cover for the soil are among the important necessities stressed.

There are 17 chapters comprising the book. The introduction in the first chapter gives a background in sequence, beginning with "lessons from the past," etc., to the "establishment of the Federal Soil Conservation Service." Soil Erosion—wind, water, and waves; Results of Soil Erosion; Influence of Precipitation and Latitude; Influence of Slope and Soil; and Influence of Natural Land Cover on Soil Erosion, are primarily the chapters devoted to the natural causes of erosion. The remaining chapters deal with the methods of control that involve the use of inexpensive farm practices and materials that are within the attainment of the individual landowner and operator. These include, in general, providing the soil with vegetative covers to protect the soil, conducting tillage operations and seeding all crops on the contour, and contour strip-cropping and terracing on sloping lands.

Well Illustrated

Besides the excellent presentation of material in text style, there are 195 appropriate illustrations that contribute a great deal to the reader's interest throughout the book. These show typical examples of what careless neglect has done to our soils. In contrast to a most dismal scene in the past, several illustrations portray what

can be done by following such treatments that have proved "land savers."

In the author's own words, "Soil erosion in the United States has been recognized as a menace to agriculture, if not to the population as a whole, for many years. A beginning has been made during the past 30 years, and more particularly during the past decade, in obtaining accurate information on the losses of soil by erosion and on methods of controlling these losses under varied cropping systems."

Because of his fundamental knowledge of erosion control measures, and having recently been on leave of absence from his regular duties to serve as chief soil erosion expert on a Federal Soil Conservation Demonstrator Project in southern New York, the author is especially well qualified to write up-to-date authoritative information on conservation of the soil. The book is of concern to landowners and operators, county agricultural agents, to college and high school courses in soil conservation, and to general readers.

Ohio Flood Wastes Tons of Fertile Upland Soil

Of the many million tons of fertile soil washed from upland farms by the January floods, nearly 40 million tons were spread over bottomland and city streets in the Ohio Valley, reports the Soil Conservation Service. The report is based on a survey which included actual measurements of soil removal and silt deposits all along the valley from Pittsburgh, Pa., to Cairo, Ill. Even larger quantities of agricultural soil probably were carried down the river below Cairo.

The swiftly moving waters deposited more than 25 million tons of silt in the rural areas of the valley proper, a further 8 million tons on the bottomland of several tributaries near the confluences, and nearly 4 million tons in 165 towns and cities of the valley—based on sample measurements in 27 river communities most seriously affected.

Farming land in the valley also was damaged severely by more than 11 million tons of sand churned up from the river bottom and laid down over adjoining fields and meadows.

"These studies show clearly that flood damage is by no means confined to the casualties caused by the actual inundation," says H. H. Bennett, Chief of the Service. "In addition to the burden and expense imposed on the cities and riparian farms, this silt represents an enormous soil loss to the agricultural communities of the entire watershed."

Apply Boron to Prevent Darkening of Turnips

(*From page* 22)

double amounts, but single rates had been insufficient for complete control and without buffer rows, his checks may have been influenced slightly by cross feeding roots. A rate of less than 10 pounds apparently applied was insufficient to overcome the boron deficiency of that soil.

From our experiences to date, some suggestions may be noted:

1. Borax definitely controlled dark center of rutabagas in all tests where used in sufficient amounts (15 to 30-pound rates).

2. Boron apparently is deficient in many soils of the State evidenced at least so far as dark center of rutabagas serves as an indicator crop.

3. That ordinary soil amendments commonly used fail to supply necessary amounts of boron to prevent dark center.

4. That further demonstrational work should be done to determine the probable effect of repeated applications of borax, rate of fixation and leaching.

5. That a method should be established for the most practical procedure of supplying boron to soils, whether as borax broadcast, sprayed, drilled, or supplied in regular fertilizer mixtures.

Potato Improvement in Wisconsin

(*From page* 12)

both materials running high in lime content.

Last year through the cooperation of local dealers 4 carloads of muriate of potash were distributed to local farmers. Potash is the kind of plant food that has most seriously been removed from the soil through the exportation of potatoes. Early this year, with the assistance of their County Agent and local dealers, Waushara potato growers placed their orders for nearly a trainload of potash.

A far-reaching and what appears to be a successful potato seed improvement program was inaugurated last spring by the Waushara Agricultural Committee through the introduction of a carload of the finest russet rural seed potatoes available. These potatoes were distributed mostly in 500-pound lots to farmers at cost. They were purchased early in the season when prices were still low, and therefore most farmers were able to sell their own stock at about the same price that they were asked to pay for this new seed. In spite of the drought and unfavorable growing weather, this seed averaged 138 bushels per acre, thereby making available about 13,800 bushels for seed for local growers in this county this year—enough to plant approximately 2,300 seed acres.

Of course these results are for one year only, but growers who tried out this seed tell us that it:

1. Is resistant to scab, although scab was not serious last season,
2. Is a high-yielding strain,
3. Produces a good stand,
4. Reproduces good type,
5. Produces an eating potato of high quality.

Working with nature in this soil-building program, Waushara potato growers are going to solve the most serious of their potato-growing problems. In the meantime we are looking to the plant breeders for new varieties which are resistant to scab.

In the future these potato growers with their trucks and car trailers will be going after their old market, not with the under-grade product that has been produced in the past decade, but with a high quality, health product, individually packed and labeled. The Waushara County Potato Improvement Program is a hook-up of common sense, science, and nature, with the sporting blood of true potato-minded farmers—a heritage from the pioneer Potato Kings of the 90's.

From Pine Forests to Sweet Potatoes

(*From page* 19)

tato starch can be used in the place of both white potato and Cassava starch. At the price farmers are getting for the raw product, sweet potato starch can compete with white starch, but the low cost of Cassava makes it a harder item to replace.

Farmers living within a radius of about 20 miles of Laurel furnish the plant its raw material. Most of them are cotton farmers who are using the sweet potato as a supplementary cash crop, and although raising sweet potatoes is not a "get rich" enterprise they are adding to their cash income regularly. If it's a wet year and the cotton crop fails, the sweet potatoes come through; and if it happens to be too dry for sweet potatoes, cotton usually thrives.

Up-to-date research is carried on at the plant's well-equipped laboratory.

Asparagus in Ontario

(*From page* 15)

able unless accompanied by deep planting and then only on very favorable soil where long life of the patch is expected. In general, rows 4 feet apart and plants 18 to 24 inches apart in the row are best for shallow plantings, as the maximum yield per acre is reached earlier. On high-priced land, such as is used for much of the asparagus in Ontario, it is more profitable to bring the young plantings to full yield as soon as possible even though they may not live as long.

The Mary Washington variety is grown in Ontario almost entirely, but the high standard of the original stock is not being maintained in some of the stocks offered today. This variety carries some resistance to the rust dis-

ease *Puccinia Asparagi.* It should be very vigorous in growth, producing large, thick sprouts which do not bud out early. It should also carry a fair degree of uniformity as to type and color.

Rust and Insects

The rust is seldom serious in Ontario, but may be found in nearly every patch. Where it is noticed to any extent it would be wise to cut and burn the tops in late fall. This also applies to the control of insects. Many growers prefer to leave the tops over winter to collect snow. The old tops are disked into the soil early in the spring. This adds both moisture and humus to the soil.

There are two insects which frequently injure the asparagus crop. The common and more serious one is a small, bluish-black beetle with yellow markings on the wing covers. *Creoceris Asparagi L.* It is most noticeable when wintered-over adults are feeding on the young sprouts and young top growth. Egg-laying on sprouts is also objectionable as the eggs are difficult to remove. This insect does more serious injury, however, on the top or summer growth of the plant. It may seriously reduce the yield for the following season. The other insect is larger and called the spotted asparagus beetle. It is reddish in color with 12 black spots on the wing covers. It is not so common nor nearly so injurious as the first. The larva usually feed only on the seed berries.

The best control measures for both insects are to cut the bearing plants frequently, to spray young plants and the late growth after cutting season with a poison spray (2 pounds of arsenate of lead to 40 gals. water with 2 pounds of soap), and to cut and burn the tops and other nearby rubbish in late fall.

On Apple Orchards Use "Congenial" Fertilizers

(*From page* 10)

balanced diet, it would be well to consider these elements at all times.

It should be stated that there is some variation in the amounts shown to be removed by the fruit. The best level from which to make computations is from analyses of fruits taken from unfertilized trees, since heavily fertilized trees and their fruits will draw more heavily and show much higher amounts of the different nutrient salts. Additional investigation in this connection should be of much value, particularly with unfertilized trees grown in a definitely analyzed soil.

Profit Increases With Age

With an expenditure of 10 cents per tree for complete fertilization, the yield of a typical root-crowded apple orchard was increased by over 2 bushels per tree. At this rate apples selling at 50 cents a bushel would bring a gross profit of $1.90 per tree. Attention should be directed to the possibility of a higher rate of profit from complete fertilization in many apple orchards as the trees gradually increase in age.

Until within recent years apple growers were almost dogmatically urged to make application of fertilizers to apple trees only in the spring, several weeks before blossoming. Reports made by the writer in 1926 showed some superior results from fall applications. In the conclusions, the writer pointed out that certain nitrog-

enous applications can be made in other periods beside the traditional spring recommendations, with equal or in some instances better growth and yield responses.

Since then these results have in various phases been verified by other investigators. Among these are Browne of the Dominion Experimental Farm at Abbotsford, Quebec, Kimball in Canadian Horticulture, Olney and Magill of Missouri, Gourley of Ohio, Lewis of Ohio, Schrader and Auchter of Maryland, and Harlan and Collison of New York.

Fall Applications

Recently Professor A. H. Teske of the Extension Division of Virginia Polytechnic Institute, commented as follows: "In the past, fertilizer applications to fruit trees have generally been made in the spring from the time that the buds began to swell up until and through the blooming period. In recent years fall applications have come into use to some extent. The work that has been done to date with fall applications indicates that not only can satisfactory results be expected with fall treatments, but that under certain conditions and tree performance there may be some distinct advantages gained from applying fertilizers to apple trees in the fall. It has been shown that there is an increase in the nitrogen of the rootlets and larger roots, from fall applications, and that there is a larger percentage of starch in the non-bearing spurs during June. That being the case, fall applications may have a distinct advantage in short crop years as is the case at the present time."

Another comment made recently is that of Dr. J. H. Gourley of the Ohio Experiment Station. This statement by Dr. Gourley is of especial significance. Interesting particulars quoted from his results are as follows: "Fall fertilization of orchards appears to be on the increase. There is ample evidence that at least equally good results can be secured if the fertilizer is applied from the middle of September to the middle of November, and without injury to the trees."

It has been found by the writer over a period of 10 years' observations that active development of feeding rootlets come to almost a definite stop about the middle of July. Resumption of development commences again in about the second week of August. This activity continues well into heavy freezing weather. Of course, under laboratory conditions, there is very little solute intake as the temperature approaches freezing, but in the orchard with a varying amount of insulation from different soil media, rootlet activity may continue with air temperatures as low as 10 degrees above zero Fahrenheit. Spring resumption of rootlet activity is often much slower than the activity that is in progress up to the severe freezing temperatures approaching winter. It often takes until the middle to the last part of April for maximum rootlet activity. All of this very likely accounts for some of the more noticeable responses due to fall fertilizer applications.

In experiments conducted by Aldrich of the U. S. D. A., it is observed that during winter nitrogen taken up by the small rootlets was translocated into larger roots, and that this translocation in sections north of Virginia continues during the 3 to 4 months following a fall or winter nitrate application. In the medium-sized roots of the unfertilized trees, it was found that the nitrogen was apparently moved out into other parts of the tree faster than it was moved in from the absorbing rootlets.

It is the opinion of this investigator that since on May 15 at full bloom the medium-sized roots were higher in nitrogen than those of the unfertilized groups, the large roots function as storage tissues. "The fact

that medium-sized roots from the unfertilized trees decreased in nitrogen content during the winter indicates that in the case of all trees there was some movement of nitrogen out of the larger roots into other parts of the tree during that time." The most significant point indicated in these investigations is the earlier nitrogen content due to earlier fall applications.

Winter-killing

It is very frequently asked by fruit growers of this state, "To what extent are apple trees in Virginia subject to winter-killing as the result of different seasonal fertilizer applications?" A relatively long period of observations made by the writer and the records in a 25-year-old experimental orchard in Blacksburg offer interesting information in these particulars.

One series in this experimental orchard has been kept in clean cultivation throughout the entire growing season, another under partial cultivation, and the third in sod. These cultivations are crossed by replicate fertilizer treatments. In the plots of the clean-cultivated series to which nitrogenous fertilizers have been applied, particularly in the lower spots with a prevalence of liberal moisture and food supply, the conditions were such as to allow for uninterrupted growth up to freezing temperatures. In the sod the trees in most places were deprived of moisture long in advance of such freezing temperatures, especially in the higher parts of the orchard and where no fertilizers were added.

On the whole, this experimental orchard provided a very representative assortment of conditions for prolonged and for checked growth through the usual growing season up to the time of freezing temperatures. Likewise, during this period of 25 years several zero and sub-zero temperatures were recorded. Some of the lowest temperatures during this period are recorded as follows: 1912—zero, 1913—6° above, 1914—15° above, 1915—6° above, 1916—3° above, 1917—27° below, 1918—16° above, 1919—zero, 1920—1° above, 1921—3° above, 1922—9° above, 1923—5° above, 1924—6° above, 1925—4° above, 1930—1° above, 1931—3° above, 1932—9° above, 1933—zero, 1934—4° above, 1935—4° below.

During this entire period there was no perceptible winter injury other than an occasional longitudinal bark-splitting in some Grimes and Stayman trees in the sod series that were not fertilized and some in trees that were injured by mice. In another nearby orchard of Grimes, Starking, Stayman, and York, no winter injury was found where applications were made of either calcium cyanamid, sodium nitrate, or ammonium sulphate, long before the summer growing activity of the trees receded, and in spite of the fact that such applications may have caused succulent growth to continue into freezing weather.

Observations made of many trees that were killed during the winters of 1931, '32, and '33 showed that in every instance these trees had been suffering either from lack of sufficient summer or fall soil moisture or from some factor that deprived them of maintaining a proper condition of health and vigor. Such factors as mouse injury, wooly aphis on the roots, borer infestation, root-rot ravages, or various canker injuries may cause apple trees to become so weakened that they are unable to survive the further desiccating effects during the winter periods which usually finally cause these weakened trees to die. Yet injured trees may very frequently survive some very severe winter temperatures, if the summer or fall months had been visited with an abundance of rainfall so that the trees may have the opportunity for relatively larger solute intake. Winter-killing is generally the more severe following dry summer or fall months or both, when

solute intake is impeded and the trees become more checked in vigor. An interesting report is made as follows by Dunegan and Smith.

"Observations made in the Ozark section of Missouri showed that hundreds of apple trees died. . . . It was noticeable that the loss of trees of the Ben Davis variety was much greater than that of any other variety. In this section there are many orchards of Ben Davis from 25 to 35 years old. . . . Figures on 26 scattered orchards showed them all to be infested with Illinois blister canker (Numularia discreta) in varying degrees of severity during the past season. As would be expected, these diseased trees were the first to show the effects of water shortage." These were the first to succumb to the subsequent freezing temperatures.

Keep Trees Vigorous

In their recent work, "Winter Injury of Baldwin Apple Trees and Its Relation to Previous Tree Performance and Nutritional Treatment," Collison and Harlan, of the New York Agricultural Experiment Station, report: "The fact the odd trees in the orchard which received no fertilizers showed the greatest injury indicates that fertilizers generally reduced the injury." Especially significant of certain interactional activities that occur between nitrogen, phosphorus, and potash, it would be well to emphasize these authors' statement made as follows: "Some of the treatments had specific effects, due to their action under the particular soil conditions of this orchard, which indicates that the nitrogen carrier should be fitted to the orchard soil and perhaps to the apple variety."

Winter injuries are far less severe if the summer and fall months or both are such as to allow for ample and even luxuriant growth. Trees that have been adequately nourished and watered during the growing season even up to freezing temperatures stand much better chances of surviving severe winters than trees that have had their growth checked. From the evidence secured at this station, it is safe to fertilize apple trees any time during the growing season. There is less danger of winter injury to trees that are kept vigorous and well fed prior to freezing temperatures.

Accumulated Reserves

Much valuable work has been carried on by Professor M. A. Blake, Chief, Department of Horticulture, New Jersey State College of Agriculture. In a recent article he refers to soils' accumulated reserves. He points out that during the first 15 to 18 years of this century or until the time of the World War, animal manures were available to growers, and complete fertilizers were used quite liberally in New Jersey. "Well-formed soils possessed reserves of organic matter and nutrients. Furthermore, tillage was largely done by horse-drawn tools. Then came the period when some reports from field experiments in orchards appeared to indicate that nitrogen was the only nutrient that would give worth-while commercial results in orchards. Some went as far as to suggest that only one source of nitrogen was to be recommended. Of course, such a simple solution to the orchard fertilization problem obviously had a popular appeal and was widely adopted.

"It was not at all surprising that nitrogen alone appeared to give results equal to a complete fertilizer for a time. In many cases the orchards were upon at least fairly fertile soils, and many of them had received applications of manure either before or after planting, or both. Orchards were not infrequently planted upon areas which had previously been devoted to vegetable crops and heavily fertilized for years. Applications of 40 tons of manure to the acre were sometimes made for vegetable crops.

. . . After a period of years, the first element likely to become deficient, if any, after such a practice would be nitrogen. . . . Facts will concentrate attention upon the importance of

ents supplied by the soil or from a fertilizer bag. It is equally dependent upon a supply of carbohydrates synthesized largely by the leaves and upon a conditioning of the plant, both nat-

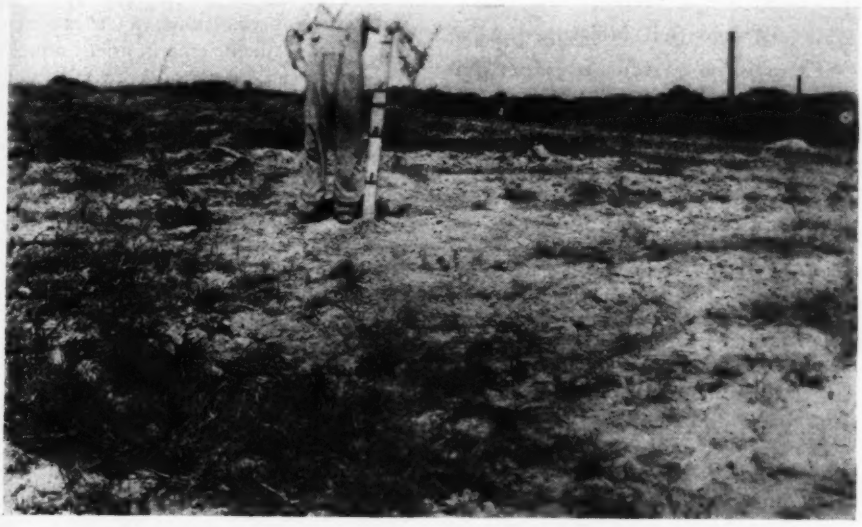

Fig. 5—Without sufficient organic matter in the orchard soil, fruit trees cannot be expected to make sufficient growth and be vigorous yielders of high-grade fruit. The organic content of such soils must be materially increased.

judging the nutritional needs of plants by means of their external appearance and not by soil conditions alone.

Proper Conditioning

"Last, but not least, is the matter of the proper conditioning of plants, which is fundamental to success in commercial fruit growing. An athlete is said to be in good condition when he is in good health and attains maximum endurance and physical ability. It is not merely a matter of being well fed. Likewise, a plant may be well fed but in either a poor or a good condition for production. Healthy, vigorous, 1 to 3-year-old apple trees do not produce fruit, and no modification of a nutrient treatment will maintain their growth and health and enable them to produce a crop of fruit. A plant does not grow and fruit merely as a result of nutri-

ural and artificial, which is favorable to fruit production.

"An apple tree which makes an excessive vegetative growth in spring will develop shoots and water sprouts instead of fruit buds and be unproductive. Any fruits which are produced will be dull, smoky red in color, and of poor texture and quality. This means that we are rapidly approaching a stage where sound and correct fertilization of orchards will be based upon the kind of fruit, the variety and age of the trees, the growth status of same, as well as the class and fertility of the soil, and the nature of the climate. In New Jersey where the trees, cover crops, and weeds all make a good growth, a 3-12-6 fertilizer is recommended as a basic treatment to be applied broadcast. The amount which should be used will vary from 500 to 1,000 pounds per

acre according to the kind of fruit, the variety, the age and size of the trees, the character of the soil, and the climatic conditions of the area. Additional nitrogen should be applied as a supplement to this basic fertilizer according to the needs."

Ample Soil Moisture

There is no factor of greater importance to the growth and fruiting of apple trees than ample soil moisture. Without this factor, apple growing would be futile, no matter how rich and fertile the soil may be. Next to controlled irrigation, a system of maintaining as much organic matter in the soil as possible is the most effective practice. The growing of certain cover crops in the soil still remains one of the best ways of securing the larger amounts of such organic matter. Just when and what to use for such orchard cover crops will differ under various conditions.

In some cases the soil is strong enough to support a lush, luxuriant vegetation. Such soil could be left to the growth of volunteer ground cover eventually to establish a sod growth which could be broken up or "cracked" occasionally as conditions require. To maintain a more luxuriant growth, applications of a 10-6-4 fertilizer at the rate of 600 to 800 and in some instances even 1,000 pounds will be found to be very profitable. These applications at such rates will also be very beneficial to plantings of rye and vetch in the fall with supplemental sprinklings of lespedeza in March. At this station we have increased the organic content of our soils materially with rye plantings in this manner. Our rye was allowed to grow to full maturity, after which it was mowed. This made a most excellent mulch over the drier summer months, added large amounts of organic matter to the soil, and then came up as a volunteer crop the following fall.

Such volunteer re-seeding has been observed for over a period of 10 years. Since a permanent sod and the accumulation of trash is liable to encourage a fire and mouse hazard, it becomes imperative to break up or "crack" the orchard ground cover at the necessary periods to effect the proper control. With such precautions, a strong orchard soil can be maintained which will more nearly supply the tree and its developing fruit with the moisture that is necessary. Apple trees amply supplied with soil moisture when the need is critical will more likely produce sound, well-finished, and highly colored fruit. Such trees will be more likely to produce crops with greater regularity from year to year and survive the more trying periods of both summer and winter.

Well-balanced Diet

Fruit growers are becoming increasingly aware of the value of keeping their fruit trees on a well-balanced diet, especially after several heavy crop years. From the results secured at the Virginia Agricultural Experiment Station, it may be concluded that in the end it becomes necessary to apply materials other than nitrogen to apple trees. To be sure, the more outstanding responses will show up from nitrogenous applications and in some instances will suffice adequately. But as apple trees grow older, the root systems become more crowded, and large crops are removed, attention must also be given to applications of phosphorus and potash. Since soil moisture is a most important factor in apple soil management, and this factor is greatly enhanced by a system of cover cropping, it is imperative that orchard soils are adequately supplied with phosphorus and potash as well as nitrogen.

"Melvin! MelVIN!"

"What, ma?"

"Are you spitting in the fish bowl?"

"No, but I been comin' pretty close."

Nix on Nostalgia

(*From page 5*)

in tribute to our meager training or the heroism of the folks who made it possible.

Across the street a stocky cupola rises above the Tudor-Gothic-Yankee-notion architecture comprising the Methodist parish church. My father was not an addict to religious fervor, even though in his youth the camp-meetings were the only vaudeville shows permitted in his bailiwick. Yet he expected me to sidle into my best pants every Sunday and answer the roll call for Sabbath school, as his proxy.

OUR class of boys occupied a slippery, golden-oak pew in the corner, with a fat, bulky, lady teacher (wife of the hardware merchant) standing like a mattress at the only open end to keep us safely corralled while the pennies were collected and the "leaves of love" distributed. It was my experience here which steeled me in later years to assume class leadership of a group of "calf-stage" lads who had the same uncanny ability that we did, to turn the Sabbath conversation from the apostles to athletics or from old miracles to modern marvels.

Probably our methods were faulty. We taught that faith is the substance of things hoped for, the evidence of things not seen, as Paul averred. But to restless, ever-modern youth faith is fed on realities, and no saintly topics we discussed, from mystic voices on Sinai to the burning bush of Moses, could beat the radio, the aeroplane, or the automobile for spiritual exaltation.

Taking my cue, therefore, from these remembrances, I clamber into the car again and resolve to return to the present and acknowledge the wonders of the hour. Better a few bright notions and current nonsense than too much nostalgia.

IF there be any excuse open to our elder generation to hark back to and harp upon the past, it may lie in the conditions some of us experienced. Possibly we are not looking backward to "better times," but rather putting ourselves in tune so as to help young folks enjoy the present, and thereby enjoy it with them.

Many of us rural youngsters of other days fell far short of living the lives we should, and it was largely lack of adult inspiration and imagination which denied us that opportunity. By this I refer to community and to group leadership, not necessarily involving much money, but merely appreciation of the needs of youth. It is true that some of us had parents with ideals far beyond the circle in which their lots were cast, but being in a minority they could do little to enliven the whole.

THIS same stagnant hamlet whose streets I rambled as an urchin was primarily for dignified elders and the treasures they cherished selfishly. Any young, exuberant person with fun-loving propensities had a pretty difficult road to tread. The greed of the elders in authority lined the streets with saloons and other questionable enterprises, but expected youth to lead copy-book lives of orderly decorum so they might in turn acquire property rights or inherit some grubby business in the same old, cheerless social desert.

There were few ingenious ones to devise delightful ways for youth to exert its vitality and talent. We kids day-dreamed and mooned around, often growing morbid, possibly forlorn and misunderstood—all for want of the vitalizing influence of the group activities which today are working wonders for the rural boys and girls.

If the girls were unwed at 25 they were classed as unlovely old maids

and expected to dress the part or get a bad name! If a penniless boy showed manly distaste for the gossip and goose-stepping of Main Street, he was apt to be iceberged out of the community or obliged to remain in it as a poorly-paid bachelor, working dully beside the faded beauties he once glanced at with warmth and romance. Our doting parents joked with us about certain girls, but they knew as we did that marriage was as highly problematical as a good job, and our final revolt and leave-taking was a needless tragedy to them and to the welfare (perhaps) of the community. And sad to say, the girls of those times were hardly the independent creatures they are today, and therefore doomed to exert their motherly instincts as teachers or "practical nurses," with hopes and hope-chests relegated to the attic.

FOR the thing that ailed us all was lack of heroes and hero-worship, except the drab, second-hand articles we got out of the town library or bought for a dime from the shilling-shocker shelves. We were forever reading of achievements in some golden age of Guineveres, Ronalds, and Lancelots, intermixed with Susan B. Anthony, Florence Nightingale, Daniel Webster, and—Nick Carter or Bob Fitzsimmons, *sub rosa!*

Our frustrated parents persisted in giving the air of distinction to distant and unapproachable divinities and demigods of the day, and made cold marble shrines out of such people who were as ordinary and comical as we, when they retired in their flannel nightgowns. The de-bunkers came too late for us fellows! For it was the de-bunkers, you know, who have made our heroes lovable and human, touchable and approachable. They have worked with the youth movements of today in making it possible for youngsters to *participate* in hero-making instead of merely reading and moping about it.

In other words, my friendly readers, "them was the daze" of inferiority-complex courses, taken right at home without tuition fees. Many juveniles were made into brass monkeys in those smug little spots; and they heard nothing, saw nothing, and said nothing—and the old world whizzed by and left them stranded in the backwaters of fear and mediocrity.

That's why you and I insist on our kids joining something and doing something, even if it keeps us from a golf club, which we don't care for anyhow! It seems to me that with our counsel and encouragement, they will go a long way in reforming the places where we were hatched in such "artificial heat." If they can make this present scene a trifle easier and nicer to live in, they will improve on their forerunners, who seemed to think chiefly of two discordant things, their money and the millennium!

ALL I need to do is to spend a half day in that seedy, little tank town and work my memory a trifle. Then I hastily take an antidote by listening to the Future Farmers broadcasting their chapter meeting, or watch the girls rehearse a dress revue for the 4-H rally.

This and a couple of high-school debates, a band tournament, a travel club, and a junior dramatic society pretty well cure me of my "noxious nostalgia."

If you were born under the same stunted star, you likewise have reached the same conclusion. And this is it!

A doctor had an urgent phone call from a gentleman saying his small son had swallowed his fountain pen.

"All right! I'll come at once," replied the doctor. "What are you doing in the meantime?"

Whereto came the unexpected answer, "Using a pencil."

This year, recommend a mix with a higher percentage of

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GREAT GAME

For the fiftieth time the two rather careful boxers had fallen into a clinch.

"Turn aht the lights!" shouted a voice from the gallery. "Them two lovin' 'earts want to be alone!"

"Leave them lights alone!" shouted another voice. "I want to read!"

A man went into a shop to buy a fountain pen. The assistant gave him one to try, and he covered several sheets of paper with the words, "Tempus Fugit" ("Time Flies").

The assistant offered him another pen. "Perhaps," she said, "you'd like one of these better, Mr. Fugit."

THERE'S SOME MISTAKE

Scene: A Mississippi plantation. A negro boy knocks on the door of a cabin.

"Oh, Uncle Joe, I jes saw a daid man laying over in the holler, and thought maybe 'twas you."

Uncle Joe (coming to door): "What'd he look lak?"

Black Boy: "He wuz about your size, and——"

Uncle Joe: "Did he hab on a flannel shirt?"

Black Boy: "Yup."

Uncle Joe: "Wid red and white checks on it?"

Black Boy: "Nossuh, it wuz plain gray."

Uncle Joe (closing door): "Nope, it warn't me."

Stranger: "I hear you have a fine cow now. What will you take for her?"

Farmer (cautiously): "Wait a minute! Are you the new tax assessor or has my cow been killed on the railroad?"

Percival: "Daddy, do they raise political plums from seeds?"

Daddy (who never had one): "No, young man. Political plums are more often the result of a bit of clever grafting."

Clerk: "Mr. McPherson, how about buying the latest atlas?"

Mr. McPherson: "Not noo, mon; I'll wait until the affairs in Europe are more settled."

SLIGHT OF HAM

A big buck Indian had just ordered a ham sandwich at a drug counter and was peering between the slices of bread when he turned and said to the waiter: "Ugh, you slice 'em ham?"

The waiter replied: "Yes I sliced the ham."

"Ugh," grunted the Indian. "You damn near miss 'em."

Greatly agitated, a woman carrying an infant dashed into a drug store.

"My baby has swallowed a bullet," she cried. "What shall I do?"

"Give him the contents of this bottle of castor oil," replied the druggist calmly. "And then be sure you don't point him at anyone!"

WHO ENRICHES THE SOIL ENRICHES LIFE

Ewing Galloway

HITCHED TO THE HORIZON

FERTILITY has always been a lodestar to the pioneering urge of the American farmer. Once it hitched his covered wagon to the horizon and sent him forth in search of the elusive land of milk and honey. Today it lures him to the laboratory where Science helps him to find fertile frontiers within his own fields.

The scientist blazes the trail toward a better life. The commercial man widens it into a highway. The fertilizer truck has replaced the prairie schooner. No longer must the farmer search for fertility. It is brought to his fields, scientifically correct and mechanically perfect.

The farmer, the scientist and the fertilizer man have found a land of milk and honey fairer than the fondest dreams of their forefathers. But the pioneering urge is still alive. The horizon is always just ahead. The common goal is a richer life.

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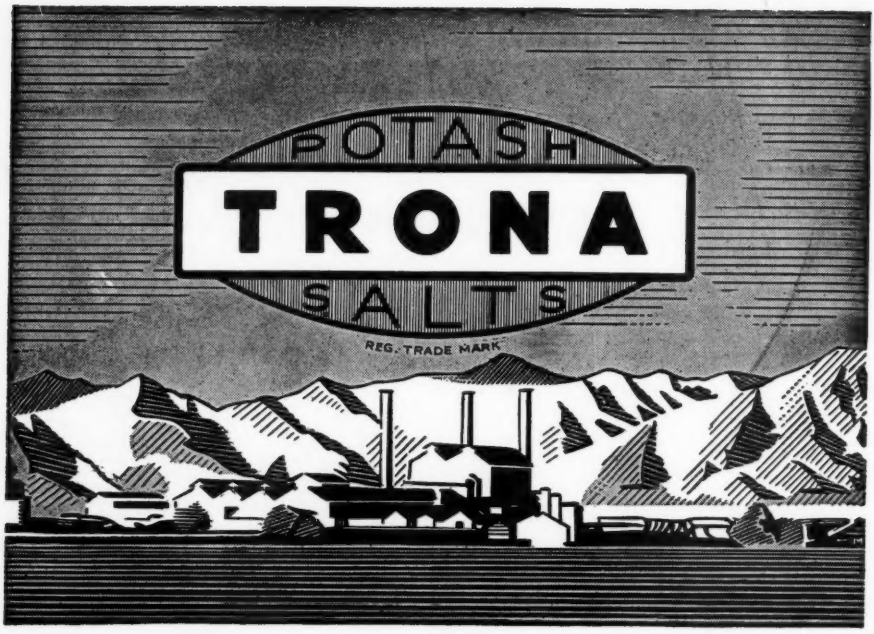

Trona on Searles Lake, California

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